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PULP & PAPER

November 1984

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PULPING: Working on the [illegible]

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PULP&PAPER

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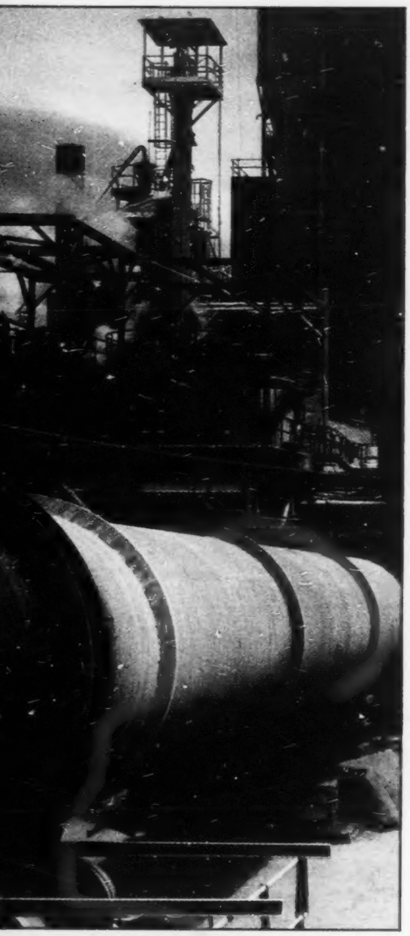

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COVER: *MacMillan Bloedel cuts lime kiln fuel oil use 50% by converting to gasified wastewood (see page 140). (Photo courtesy of Lamb-Cargate.)*

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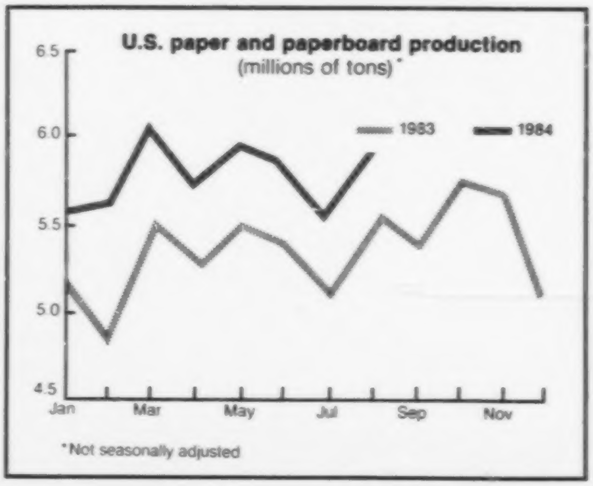
MONTH IN STATISTICS

U.S. paper and paperboard production showed little increase from a year ago, but the August 69.4-million-tpy moving average of seasonally adjusted data held close to the July average of 69.6 million tpy, according to the American Paper Institute. There are indications that the demand for paper and some grades of paperboard is easing from the torrid pace set in the earlier months of the year.

Among the major grades, early indicators are signaling caution within the printing paper grade sector as new orders for uncoated free sheet have been below shipment levels since March. Paperboard production is up 8.1% over last August, lagging behind the year-to-date comparison of 9.4%. Corrugated box shipments were 4.7% ahead of August 1983, a little slower pace than the 8.4% increase shown in the comparison of year to date figures. Imports in July, reflecting a strong U.S. dollar, were up 48% over July 1983.

Canadian newsprint shipments totaled 752,000 metric tons in August, up 8.0% from August 1983, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates stood at 94% in August compared with 86% last year.



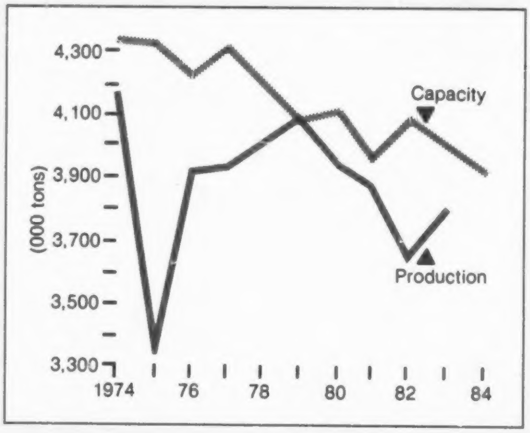
		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION¹					
Newsprint	August	470	2.6	5,585	8.3
Uncoated groundwood (s)	August	118	−8.5	1,578	6.0
Coated paper (s)	August	528	5.0	6,193	12.1
Uncoated free sheet (s)	August	749	−0.9	9,227	6.4
Unbleached kraft packaging and industrial (s)	August	318	−9.4	3,918	4.4
Tissue	August	432	10.8	4,911	3.0
Total paper	**August**	**2,896**	**0.8**	**34,858**	**7.2**
Kraft linerboard, unbleached	August	1,427	9.3	16,278	9.7
Semichemical medium	August	449	10.6	5,225	12.0
Bleached paperboard	August	352	7.6	4,130	4.9
Recycled paperboard	August	641	3.4	8,031	10.0
Total paperboard	**August**	**2,970**	**8.1**	**34,875**	**9.4**
Total paper and paperboard*	**August**	**5,866**	**4.4**	**69,733**	**8.3**
[illegible]					
Total woodpulp production	July	4,525	10.0	55,856	7.8
Market pulp production	July	570	15.2	6,763	5.5
Wastepaper consumption at paper / board mills	July	1,219	8.1	15,802	10.4
Pulpwood consumption (cords)	July	7,192	5.7	88,078	4.2
[illegible]					
Corrugated box shipments (billion ft²)	August	23.759	4.7	180.067†	8.4
Containerboard inventories at box plants	August 1	2,767	11.3		
INTERNATIONAL TRADE²					
U.S. paper imports (including products)	July	1,039	48.0	10,977	27.7
Imports of Canadian newsprint	July	695	29.9	7,595†	13.8
U.S. paper exports (including products)	July	376	−9.6	4,557	−1.2
Exports of unbleached kraft linerboard	August	215	13.2	2,151	−8.3
Exports of woodpulp	July	279	7.7	3,637	2.2
CANADIAN STATISTICS⁴ [illegible]					
Total newsprint shipments	August	752	8.0	5,952†	9.2
Operating rates	August	94%	86%	91%	83%
Inventories held by U.S. consumers	August	938	4.6		
Woodpulp shipments (export only)	August	618	−0.8	4,363†	−0.6
Operating rates	August	94%	86%	91%	83%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

Unbleached kraft paper: High operating rates but no growth

Statistics	1982	1983	1984e
Production, 000 tons	3,688	3,807	4,015
Capacity, 000 tons[1]	4,091	4,001	3,911
Utilization rate, %	90.1	95.2	97.4
Imports, 000 tons[2]	23	42	54
Exports, 000 tons[3]	89	116	104
Apparent U.S. consumption			
000 tons	3,622	3,733	3,965
lb/capita	31.2	31.9	33.5
000 tons/$ billion real GNP (1972)	2.45	2.43	2.43

1. American Paper Institute (shipments). 2. American Paper Institute capacity survey (1983). 3. Commerce Dept. e = *Pulp & Paper* estimate.



Estimated capacities of major U.S. companies	Annual capacity (000 short tpy)	Capacity share (%)
1. St. Regis	550	14.1
2. Georgia-Pacific	536	13.7
3. Stone Container	494	12.6
4. Union Camp	425	10.9
5. Longview Fibre	320	8.1
6. International Paper	260	6.6
7. Gilman Paper	205	5.2
8. Champion	160	4.1
9. Westvaco	150	3.8
10. Chesapeake	115	2.9

U.S. capacity (1984): 3.911 million tons
Capacity share of top five companies: 59.4
Capacity share of top ten companies: 82.2

GRADE STRUCTURE: Unbleached kraft paper (UKP) is normally divided into four end-uses: wrapping, bag and sack, shipping sack, and other converting. Bag and sack paper is the largest category, accounting for about 59% of total shipments, followed by multiwall shipping sack, 24%; other converting, 14%; and wrapping, 3%.

Basis weights for bag and sack paper range from 30 lb to 80 lb/3,000 ft², with the lower basis weights used for small grocery and merchandise bags and 70 lb most commonly used for grocery carryout sacks. Multiwall shipping sack paper is usually 50 lb or 60 lb. Extensible or air-dried paper may be used for shipping sacks and other bags requiring greater strength and toughness.

PRODUCTION/CAPACITY: UKP shipments have been coming back after reaching a low of 3.7 million tons in the 1982 recession year. Shipments this year should rise about 5.5% to 4.0 million tons, almost back to the prerecession peak of 4.1 million tons in 1979. Because of a slight decline in capacity, operating rates this year will average 97.4% vs 95.2% in 1983, and 90.1% in 1982.

Unbleached kraft bag and sack shipments have been remaining stable at about 2.2 million tons despite competition from plastic grocery carryout sacks, which last year captured about 5% of the U.S. market, according to the American Paper Institute. Multiwall shipping sack paper has shown some improvement this year after dropping to around 880,000 tons in 1982-83 due to the recession and the federal government's Payment-In-Kind program, which depressed agricultural demand.

OUTLOOK: Production of UKP will probably show a declining trend over the next several years due to competition from plastics, although operating rates should remain high due to conversion of machines to linerboard and white paper.

Some forecasters have predicted that plastic sacks will capture as much as 25% of the grocery carryout sack market over the next several years. If true, this could result in a production loss of roughly 380,000 tons. However, inroads from plastic sacks so far have been proceeding more slowly than expected, perhaps because of higher labor costs for bagging at supermarkets.

According to the 1983 API capacity survey, UKP capacity is expected to decline by 247,000 tons between 1982 and 1986. This would cause capacity to drop to 3.84 million tons in 1986. Since then, several other capacity withdrawals have been announced. Georgia-Pacific is phasing out 120,000 tpy of UKP capacity at its Crossett, Ark., mill in 1984 and may phase out another 280,000 tpy by converting a machine at its Monticello, Miss., mill to linerboard in late 1985. International Paper is converting a 135,000-tpy machine at its Mobile, Ala., mill to white paper in early 1985.

PRICING: UKP pricing, particularly for heavyweight grocery sack paper grades, was under severe pressure during the recession. This was due to excess linerboard production being swung into the kraft paper market. There is an estimated 1.0 million tons of such swing capacity in the industry. Since the second half of 1983, however, kraft paper prices have been coming back strongly, helped by the firming linerboard market.

Year-end price history for 70-lb grocery sack is as follows: 1978, $240; 1979, $260; 1980, $280; 1981, $300; 1982, $240; 1983, $280; mid-1984, $360 (with discounting). Multiwall sack kraft (50-lb): 1978, $305; 1979, $340; 1980, $375; 1981, $405; 1982, $360; 1983, $380/$410; 1984, midyear $440 (with discounting).

(News section continues on page 23)

Rock-Tenn buys Stroudsburg mill

Rock-Tenn Co. became "the largest privately owned paperboard and packaging producer" with the Sept. 28 purchase of Stroudsburg Paperboard Co.'s 40,000-tpy recycled clay-coated board mill in Stroudsburg, Pa., the company said.

The Stroudsburg mill, bought last July from Packaging Corp. of America by a group of investors headed by Chuck Dufon of Toronto Paperboard Co. (*P&P*, Sept. 1983, p. 33), is the fourth in Rock-Tenn's mill division. Other mills include the 47,000-tpy Eaton, Ind., 100,000-tpy Chattanooga, Tenn., and 126,000-tpy Dallas, Texas, recycled paperboard mills.

Rock-Tenn, a privately held company, owns a total of 47 paper and board manufacturing and distributing facilities across the country, according to a Rock-Tenn announcement. Its entry into the primary industry began with the purchase of the Dallas mill from Clevepak Corp. in 1979. The Eaton mill and several converting facilities now owned by Rock-Tenn were also bought from Clevepak, the sale occurring last August (Aug. 1983, p. 25). At the time, Clevepak was divesting its assets to pay off debt.

One industry observer felt Rock-Tenn would switch the Stroudsburg mill from clay-coated to chipboard to supply its seven fiber partition plants and its filler board facilities, but another observer said the company would continue to produce folding carton board at the mill. The company said it would announce plans for the mill later.

O-I issues stock poison pill

Acting to block a possible unfriendly takeover, Owens-Illinois Inc. in September approved a special issue of preferred stock designed to make the company too expensive to any potential acquirers, an O-I spokesman said.

In early September, O-I's stock jumped sharply in heavy trading due to rumors that an unknown buyer was amassing the company's common stock in preparation for a takeover (*P&P*, Oct., p. 27). Sir James Goldsmith, who earlier made unsuccessful attempts to acquire St. Regis Corp. and Continental Group Inc., was the most popular suspect.

Correction: September's Grade Profile inadvertently contained statistics for uncoated free sheet, not uncoated groundwood paper. The correct figures for uncoated groundwood are given below.

Statistics	**1982**	**1983**	**1984e**
Production, 000 tons	1,471	1,531	1,610
Capacity, 000 tons[1]	1,749	1,755	1,733
Utilization rate, %	84.1	87.2	92.9
Imports, 000 tons	653	920	950
Exports, 000 tons	56	38	30
Apparent U.S. consumption			
000 tons	2,068	2,413	2,530
lb/capita	17.89	20.68	21.49
000 tons/$ billion real GNP (1972)	1.39	1.57	1.58

e = Estimated.
1. *Pulp & Paper* estimate.

Champion, St. Regis merger set for vote

The holding period for the Champion International Corp. and St. Regis Corp. merger expired on Oct. 8 without any word from the Federal Trade Commission objecting to the merger that would create the nation's largest paper company and the second largest producer of lumber and timber. The holding period, originally set to expire on Sept. 17, was extended to allow the FTC to further investigate the merger. During the period, Champion agreed not to exercise control over St. Regis.

In the next step of the merger process, stockholders of both companies are to vote on the $1.84-billion transaction. A Champion spokesman said the companies are working to have the merger take place before the end of 1984.

Champion was served with an FTC subpoena in late September for employee testimony and other information regarding the printing and writing paper businesses of both companies as part of the FTC investigation of Champion's purchase of St. Regis. Both companies produce coated paper, and industry analysts say that together they account for 16% to 17% of total U.S. coated paper capacity. However, each company produces different types of coated paper for different markets. All of Champion's capacity (365,000 tpy) is in higher quality coated free sheet used in commercial printing, while St. Regis makes only coated groundwood paper (625,000 tpy) for magazines and catalogs. Therefore, Champion did not believe that combination of their coated paper operations would violate U.S. antitrust law.

Another area of antitrust concern to the FTC was linerboard. As part of an August agreement with the FTC (*P&P*, Oct., p. 27), Champion agreed to keep St. Regis's 250,000-tpy Tacoma, Wash., linerboard and kraft paper mill separate from its operations but was allowed to make complete its tender offer for St. Regis. Champion also makes linerboard at its 375,000-tpy Missoula, Mont., mill.

Champion said earlier in September that it would carry out a St. Regis agreement to buy 22% of Colonial Penn Group Inc., but that it wouldn't acquire the rest of the Philadelphia insurance company. St. Regis already owned a 9.9% interest in Colonial, which will transfer to Champion once their merger is completed, leaving 12.1% to be acquired by Champion.

St. Regis agreed to buy Colonial in June for about $590 million in a defensive strategy which some analysts say was aimed at stopping an unfriendly takeover attempt by Rupert Murdoch (Sept., p. 27). At that time, St. Regis bought a 9.9% share of Colonial for $14.1 million plus $43 million in St. Regis convertible adjustable preferred stock.

In an agreement among Champion, St. Regis and Colonial, St. Regis will buy back, when it merges with Champion, the 860,260 St. Regis preferred shares which Colonial received for the 9.9% stake.

Terms of the original agreement between St. Regis and Colonial have been modified, and the purchase by Champion of the additional 12.1% interest in Colonial with $85.6 million of Champion stock isn't likely to occur until May or June 1986, unless Colonial is acquired before then. St. Regis agreed to pay Colonial $1.5 million for expenses related to the terminated agreement.

TECHNOLOGY

New paper process begins production

Glassper International Inc. of Memphis, Tenn., has started up a production line to demonstrate commercially its new process for chemically reinforcing paper. In development for three years, the Glassper process involves saturating a sheet with water-based, high-solids chemicals to improve strength and flame retardation (*P&P*, July 1983, p. 29).

Products include a self-extinguishing, strengthened paper called Thermo-Max, and Hard Core treatment to strengthen tubes and cores. Hard Core production is now underway with Gartex and Merkor stock from Yorktowne Paper Mills. Automotive, construction and industrial packaging applications are being investigated, as well as possible products in the decorative panel field. Licensing of technology is also available.

Ring crush tests on four brands of cores in basis weights from 80 to 102 lb showed strength improvements between 150% and 300%, the company said. Treated 60-lb low-density linerboard with 50% added solids was over four times as strong as an untreated sheet, the tests showed. Similar tests on 42-lb liner and 26-lb medium produced gains ranging from 70% to almost 500%, depending on the percentage of added solids.

Production capacity is currently limited to 50-in. roll widths, although this is being expanded to 60 in. A three-meter machine for a European company is being negotiated.

CHEMICALS

G-P to sell off commodity chemicals

Georgia-Pacific Corp. announced at the begining of October that it will sell some of its commodity chemical operations to a group of executives who currently manage them. James R. Kuse, senior vice president for chemicals at G-P, will head Georgia Gulf Corp., the new firm.

The commodity-chemical assets to be sold include the large Plaquemine, La., chemical complex, a cumene plant near Houston, a phenol plant in New Jersey and several polyvinyl chloride compounding plants. G-P had studied its chemical operations earlier this year and decided to retain the chemical lines related to its forest products businesses.

G-P also said it is continuing to evaluate bids for Exchange Oil & Gas, its New Orleans, La.-based oil and gas subsidiary, which it had earlier announced plans to sell. It is expected that the sale of Exchange and the chemical operations will result in financial writeoffs.

Anthraquinone plant closed

Schelde Chemie, a West Germany joint venture, will permanently close its 10,000-tpy Brunsbuettel anthraquinone plant because of technical problems with the new process it uses and because of a market decline for anthraquinone. The plant exploded while in the startup phase in 1983. To date, the company had spent $92 million on the process.

CAPITAL SPENDING

U.S. capital spending forecast lowered

U.S. pulp and paper companies will spend slightly less in 1984 on new plant and equipment than previously expected, but Canadian producers have lifted their sights substantially, according to two recent government surveys.

The latest Commerce Dept. survey of capital spending plans, conducted in July and August, found that U.S. pulp and paper companies planned to spend a record $7.13 billion for new plant and equipment in 1984, up 15.4% from $6.18 billion in 1983. The last survey, conducted in April and May, showed that spending would climb 16.0% to $7.17 billion.

On a seasonally adjusted annual basis, paper industry spending rose to $7.05 billion in the second quarter from $6.93 billion in the first, and outlays are expected to keep climbing. Companies planned to increase spending to $7.25 billion in the third quarter and $7.28 billion in the fourth.

Overall, U.S. business plans a 14.3% increase in 1984 capital spending compared to 1983, down from the 14.8% rise shown in the last survey. Real spending—after adjustment for inflation—will rise 13.3%, Commerce estimates.

Big Canadian increase. Although they have a long way to go before matching prerecession spending levels, Canadian producers seem to be headed in the right direction. Canadian paper and allied products companies now plan capital expenditures of C$1.27 billion in 1984, up 19.8% from $1.06 billion in 1983, according to Statistics Canada's mid-year review. An earlier survey, completed in February, showed an 1984 increase of only 2.8% over 1983, to $1.09 billion.

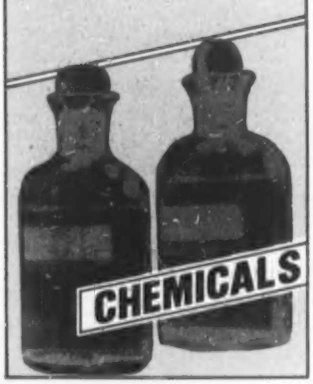
The biggest turnaround is in construction outlays. Companies now plan to boost construction expenditures 15.6% in 1984 to $151.5 million, compared with a projected decline of 16.6% shown in the earlier survey. Spending for new machinery and equipment is expected to rise 20.4% from last year, to $1.12 billion, compared with an increase of only 5.2% shown in the earlier survey. Construction now accounts for 12% of the planned capital expenditures, while 88% is earmarked for new machinery and equipment.

By province, capital outlays are expected to climb 23.9% to $526.9 million in Quebec, 21.2% to $308.9 million in Ontario, and 105.9% to $243.2 million in British Columbia. The British Columbia figure represents a major revision from the last survey, when spending was seen rising only 7.4% to $126.8 million. The revised figure of $243.2 million is still well off the 1982 pace of $366.1 million, however.

TABLE 1: **1984 capital spending in the U.S. and Canada.**

	U.S. (Billion $)	Canada (Billion C$)
1984 totals[1]	7.13	1.27
1983 totals	6.18	1.06
Quarterly spending[2]		
1984 4th quarter[1]	7.28	n.a.
3rd quarter[1]	7.25	n.a.
2nd quarter	7.05	1.27
1st quarter	6.93	1.09

[1]Estimated. [2]Seasonally adjusted annual basis.



Pulp/paper chemical use, prices continue to strengthen in 1984-85

Pulp & Paper's annual chemical survey forecasts good availability with prices firming up as paper industry continues on the road to recovery

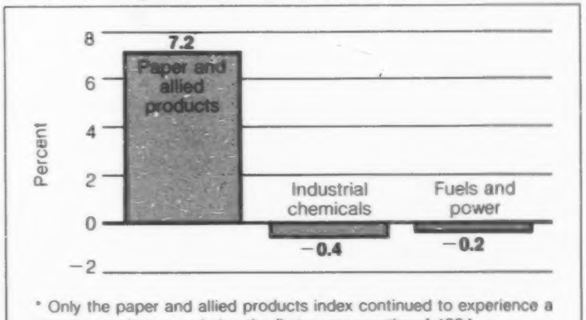
By BARRY SHOCKETT

■ Buoyed by the continued recovery of the U.S. pulp and paper industry in 1984, chemical selling prices have been firming as demand continued to increase for most products. Although discounting has continued in some cases, it is well below the level prevailing in 1983. The year-to-year wholesale price index for July 1984 (Figure 1) was down marginally—considerably less than the 3% reported in July 1983. Similarly, the fuels and power index was off slightly to 667.2 from the revised 668.7 for last year's seventh month. (In March, the index was up 0.1%, while in June it was 0.4% ahead of last year.) The chemical index, on the other hand, rose 1.7% in March and 2.1% in June. Projected price increases for some of the major chemicals in 1985 range from 5% to 15% (Figure 2); the price hikes for the organic products are at the low end of the range.

Coated paper output was running 14.5% ahead of 1983 at the seven-month mark in 1984, ensuring increased demand for various coating materials such as titanium dioxide (9%), kaolin (8%), styrene-butadiene latex (5.5%), and starch (3.5%). By August's end, paper and board output were up 8.1% and 8.8%, respectively.

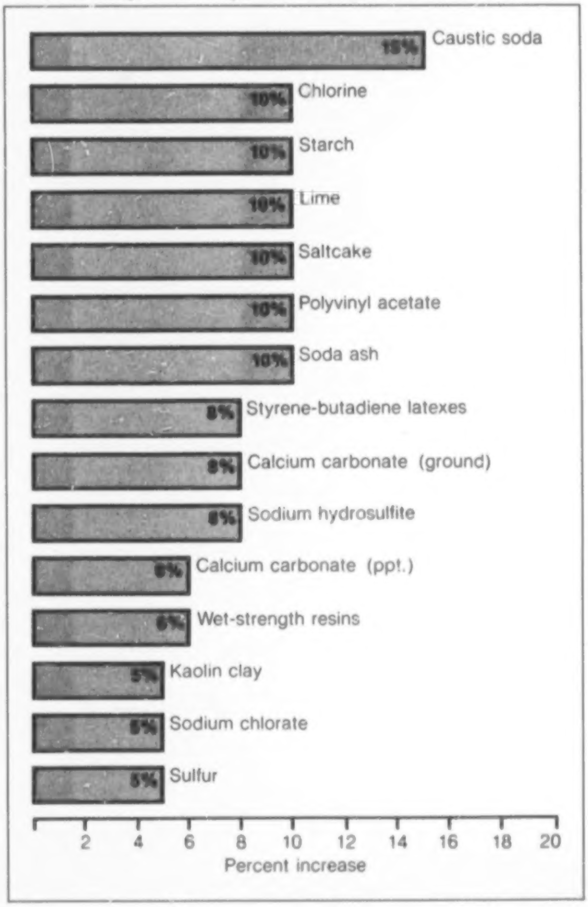
At the end of July 1984, total woodpulp production was almost 8% ahead of last year, while output of market pulp during the first seven months of this year was about 5% greater than a year ago. Thus, one can expect

FIGURE 1: **U.S. price index increases for 1984*.**



* Only the paper and allied products index continued to experience a year-to-year increase during the first seven months of 1984.
Source: Wholesale price indexes, Bureau of Labor Statistics.

FIGURE 2: **Projected U.S. price increases for chemicals in 1985.**



Mr. Shockett of Corpus Information Services, Don Mills, Ont., is consulting editor-chemical markets for Pulp & Paper.

increases in 1984 mill demand for the larger-volume chemicals such as sodium chlorate (3%), soda ash (10%), chlorine (7.7%), and caustic (11%).

The chloralkali supply/demand situation has almost returned to the scenario prevailing in early 1982 (caustic tight, chlorine long). In 1983, increased chlorine demand led to a caustic surplus (and subsequent heavy discounting). However, in 1984, increased caustic demand has resulted in significant reductions in plant inventories, while chlorine demand weakened slightly in midyear as housing starts faltered. Still, chlorine output was up 14% over 1983, based on six-month figures.

The Chlorine Institute reported that operating rates in June had risen about 5.5% to 82.3% (from 78% in May), and were significantly higher than the 67.6% rate in the comparable month a year ago. However, excluding mothballed plants, actual operating levels were reportedly more than 85%. Some of the major producers have announced plans to incorporate membrane technology to increase productivity and reduce energy costs.

A major reason for the increased caustic demand in 1984 (up about 11%) has been the continued growth in exports. By the end of July, 762,000 tons had been exported. On an annualized basis, 1984 shipments could reach 1.3 million tons, about 27% ahead of the approximate 1 million tons exported in 1983.

As was the case with caustic, sulfur supply also tightened up in 1984 as the fertilizer industry experienced a strong resurgence. Frasch mine output rose almost 23% in the January to July period, while recovered sulfur production was up 10%. Total elemental sulfur output was up 17% to 5.3 million metric tons. In addition, end-July inventories were down 13% from year-end 1983. ■

DEFINITIONS OF SURVEY AVAILABILITY TERMS:

Very tight—On allocation, or demand significantly greater than supply.

Tight—Demand slightly greater than supply.

Market—Supply/demand in balance or excess capacity available.

CHEMICAL SURVEY: U.S.

Calcium carbonate

Uses: About 85% of the calcium carbonate ($CaCO_3$) used in the paper industry is for coating, with the balance employed as filler. Precipitated grades are used in about 70% of the applications, but ground natural carbonate continues to find increased usage as finer grades are introduced.

Demand: In 1983, the paper industry consumed an estimated 154,000 tons of $CaCO_3$. With industry output up more than 8% for the first seven months of 1984, carbonate consumption by the mills should rise this year to approximately 166,000 tons. Other major end-uses include plastics, coatings, and refractories.

Sources: Producers are listed in *P&P Buyers Guide 1982*, "Register of coating and filler pigments" (p. 32).

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: Precipitated: 1984, $180-$191/ton, bulk, f.o.b. works; 1983, $170-$180/ton; 1982, $160-$170/ton; 1981, $95-$160/ton; 1980, $105-$135/ton; 1979, $98-$123/ton. Medium-ground (15-micron): 1984, $116-$124.50/ton, bags, truckload, f.o.b. works; 1983, $108-$116/ton; 1982, $105-$108/ton; 1981, $95-$100/ton; 1980, $90-$95/ton; 1979, $82-$83/ton.

Forecast: Precipitated carbonate prices rose about 6% in 1984 and should experience a similar boost next year. Medium-ground $CaCO_3$, on the other hand, increased about 8% in price and is expected to go up between 7% and 8% in 1985.

Caustic soda

Uses: Most of the caustic soda (sodium hydroxide) consumed by the pulp and paper industry is used by kraft and bleached sulfite mills mainly for caustic extraction in the bleach plant. Kraft and semichemical (NSSC) mills also employ some caustic for sodium oxide makeup.

Demand: Pulp mills in 1983 consumed an estimated 1.8 million tons of sodium hydroxide, between 17% and 18% of the 10.2 million tons produced. Mill consumption in 1984 is predicted to be up about 11% to 2 million tons, as total caustic production this year is forecast at about 11.6 million tons. Organic and inorganic chemicals together used more than 50% of the total; textiles and aluminum processing each accounted for about 6%.

Sources: Caustic soda is a coproduct of chlorine production. See the chlorine profile for major producers.

Availability: 1984, market; 1983, market; 1982, tight to market; 1981, very tight to tight; 1980, very tight; 1979, market.

Pricing: 1984, $150-$185/ton, 50% solution, f.o.b. works, freight equalized; 1983, $240-$150/ton, 1982, $315-$285/ton; 1981, $270-$320/ton; 1980, $167-$200/ton; 1979, $130-$160/ton; 1978, $160-$170/ton.

Forecast: An attempt was made at the beginning of the year to reverse the downward trend in caustic pricing when one or two producers announced a $10/ton boost on off-schedule prices. However, the increase was withdrawn when most of the industry failed to follow suit. A similar move was made in June and this time the $10/ton hike held. This was followed in August by an industry-wide increase of $25/ton, bringing the Gulf Coast tags to $185/ton. The June boost was the first caustic price hike in almost 30 months. In addition to the success of the summer price moves, the reduction in producers' caustic inventories to reasonable levels was announced. This should spur demand and facilitate further price boosts. Off-list tags are expected to go up another 15% in early 1985.

Chlorine

Uses: The major end-use for chlorine in the pulp and paper industry is as a bleaching agent in both kraft and sulfite pulp mills. Small quantities of chlorine are also employed for onsite manufacture of calcium or sodium hypochlorite used to bleach chemical or mechanical pulps.

Demand: In 1983, chlorine demand by the pulp and paper industry was an estimated 1.3 million tons—about 13% of the total demand of 10.1 million tons. In 1984, mill consumption is expected to be about 1.4 million tons. Other major end-uses include ethylene dichloride (EDC)—the intermediate for vinyl chloride monomer (VCM) manufacture—inorganic and organic chemicals, and municipal and industrial water treatment. EDC accounts for about 22% of the total.

Sources: Approximately 25 companies in the U.S. make chlorine and caustic together by the electrolytic reduction of brine. (Relatively small quantities of chlorine are also produced by oxidation or electrolysis of hydrochloric acid.) The major chloralkali producers (in decreasing order of nameplate capacity) include Dow Chemical, PPG Industries, Diamond Shamrock, Olin, Occidental Chemicals, Vulcan Materials, Georgia-Pacific, Convent Chemical, and Pennwalt. Dow's Midland unit, idled since mid-1982, has been written off. Two or three other producers have closed uneconomical plants, while several majors are involved in upgrading their facilities to membrane-cell technology.

Availability: 1984, tight to market; 1983, market to tight; 1982, market; 1981, market; 1980, market; 1979, tight to very tight.

Pricing: 1984, $175-$200/ton, f.o.b. works, freight equalized; 1983, $145-$175/ton; 1982, $145/ton; 1981, $145/ton; 1980, $145/ton; 1979, $135-$150/ton; 1978, $135-$145/ton.

Forecast: As anticipated last year (*P & P*, Nov. 1983, p. 76), chlorine prices continued to rise in 1984, but to a lesser extent than was the case in the 1982-83 period. A $15/ton hike at year-end 1983 (effective for contract customers on Jan. 1) was followed by another $25/ton boost at the end of the first quarter. There were no further changes to chlorine tags during the summer and early fall. The continuing growth in chlorine demand early this year was partly responsible for the increases. Another reason was the desire by the chloralkali producers to maintain the ECU value, which had continued to fall as caustic prices (q.v.) remained depressed in early 1984. Although chlorine demand slowed somewhat in midyear, there may be another price hike (about 10%) between now and the first quarter in 1985. Although over the long term chlorine usage by pulp mills will decrease gradually under pressure of continued ClO_2 substitution, demand in 1985 is expected to return to the 1980 consumption level of 1.5 million tons.

Hydrogen peroxide

Uses: Hydrogen peroxide (H_2O_2) is traditionally used in the pulp and paper industry primarily as a bleaching agent for chemical and mechanical pulps. It is also employed in the deinking of recycled newsprint.

Demand: In 1983, the pulp and paper industry used an estimated 15,500 tons, about 13.5% of total consumption (115,000 tons). Peroxide's major end-use is as a chemical intermediate, accounting for between 25% and 30% of total demand. Other applications include textiles, municipal water and waste treatment, industrial effluent treatment, and uranium mining.

Sources: The three U.S. H_2O_2 producers, in descending order of capacity, are FMC Corp., E.I. DuPont, and Interox America. FMC Corp. is expanding its Bayport, Texas, facility by 10,000 tpy. The expansion is slated for completion by year-end. This will increase industry capacity to 189,000 tons in 1985.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: 1984, 43¢-45¢/lb, 70% solution, f.o.b. works, freight equalized; 1983, 43¢/lb; 1982, 39.5¢/lb; 1981, 35.6¢-39.5¢/lb; 1980, 35.5¢-36.5¢/lb; 1979, 32.5¢/lb; 1978, 28¢/lb.

Forecast: Pulp and paper industry consumption in 1984 should reach 17,000 tons (up about 9.5%), while estimated apparent consumption rises to 129,000 tons (up 12%). Increased H_2O_2 usage by kraft mills (in the E-2 stage) and continued growth in mechanical pulping should result in an average annual growth in industry demand of 9% to 10% over the next few years. The 2¢/lb boost in peroxide tags on July 1 came 18 months after the previous hike. The next increase (about 5%) should occur in mid-1985.

Kaolin clay

Uses: Kaolin clays are employed in a wide range of paper and board grades as both filler and coating pigment. Coating applications account for about 54% of industry usage.

Demand: In 1983, an estimated 3.1 million tons of kaolin were used by the paper industry—about 75% of total kaolin consumption. In 1984, mill usage is expected to rise about 250,000 tons to some 3.3 million tons. Approximate usage by grades: Nos. 1 and 2, 24%; water-washed, 22%; Nos. 3 and 4, 16%; delaminated, 13%; high-brightness and air-float, 10% each; and other, 5%. The next largest end-use is by the ceramics industry (20%) with the remaining 6% accounted for by paints, rubber, refractories, etc.

Sources: Producers are listed in *P & P Buyers Guide 1982*, "Register of coating and filler pigments" (p. 32).

Availability: 1984, market; 1983, market; 1982, market; 1980, market; 1979, market to tight.

Pricing: Premium No. 1 coating: 1984, $165/ton, f.o.b. Georgia; 1983, $155/ton; 1982, $142/ton; 1981, $130/ton; 1980, $84/ton; 1979, $108/ton. Water-washed, No. 1 coating: 1984, $114/ton (same basis); 1983, $108.65/ton; 1982, $99.50/ton; 1981, $91.50/ton; 1980, $84/ton; 1979, $76/ton. Dry-ground, filler grade: 1984, $64/ton (same basis); 1983, $61/ton; 1982, $61/ton; 1981, $56/ton; 1980, $51/ton; 1979, $35-$44/ton.

Forecast: Kaolin usage has continued to grow this year as paper and paperboard output was up about 9% by the end of July (compared with the same seven-month period in 1983). Continued growth of the industry in 1985 could result in another 200,000- to 300,000-ton boost in consumption next year.

Lime

Uses: The kraft mill operator requires a low-cost alkali to causticize the sodium carbonate in the green liquor. Lime is the cheapest alkali available (between 2¢ and 3¢/lb), and therefore is basic to the soda/lime route to free caustic. Kraft mills produce reburned lime onsite.

Demand: In 1983, pulp mills purchased about 980,000 tons of lime, some 6% of total consumption, which rose slightly to 16 million tons. In 1984, mill usage should increase 5% to 6%, as total demand rises about 6%. The rationalized steel industry's share increased to 35% of the total in 1983. Other applications include treatment of sewage, chemicals, and refinement of sugar.

Sources: The major manufacturers of merchant lime, produced mainly from calcite ($CaCO_3$) or dolomite ($CaMg[CO_3]_2$) are Genstar, Kerr-McGee, Marblehead Lime, Martin Marietta Chemicals, Mississippi Lime, Pfizer, Steetley Industries, and U.S. Gypsum. (Steetley purchased Domtar's Tacoma, Wash., plant in early 1981, while Domtar completed its withdrawal from U.S. production by closing its Bellefonte, Pa., facility in mid-1982.)

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight in eastern U.S., market in West; 1978, market to tight.

Pricing: Quicklime: 1984, $66.80/ton, bulk, f.o.b. works; 1983, $63.50/ton; 1982, $57.80/ton; 1981, $51.63/ton; 1980, $46.10/ton; 1979, $41.16/ton; 1978, $36.75/ton.

Forecast: In 1984, total lime demand and mill usage should reach 17 million tons and 1 million tons, respectively. Demand by some of the smaller end-use areas should go up 10% in 1984, although steel industry usage will be up about 7%.

Polyvinyl alcohol

Uses: Polyvinyl alcohol (PVA) is employed by the paper industry mainly as a surface size for printing and writing papers and paperboard, and as a coating binder.

Demand: In 1983, paper industry usage of PVA was between 11 and 12 million lb, about 8% of the estimated total merchant demand of 140 million lb. In 1984, demand by paper and board mills should increase to between 12 and 13 million lb, while total consumption should reach the 155-million-lb level. Imports were up to 40 million lb in 1983 (from 21 million), and at the end of July 1984 they were at an annual rate of almost 55 million lb. PVA's largest end-use is for textiles (50%), followed by adhesives (25%), emulsifiers (12%), and other applications (5%).

Sources: U.S. producers of PVA, which is derived from the hydrolysis of polyvinyl acetate, are (in descending order of capacity): E.I. DuPont, Air Products & Chemicals, and Monsanto. Air Products & Chemicals and DuPont both make fully hydrolized (FH) PVA, while Monsanto produces only partially hydrolized (PH) material. Air Products & Chemicals also makes the PH grade and in midyear completed the first phase of its expansion at Calvert City, Ky. The second phase is due onstream next September. DuPont's La Porte, Texas, expansion—which will allow it to make PH as well—should be ready in early 1985.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1984, $1.05/lb, delivered; 1983, $1.05/lb; 1982, $1.05/lb; 1981, $1.00-$1.05/lb; 1980, 86.5¢-91.5¢/lb; 1979, 77.5¢/lb; 1978, 69.5¢/lb.

Forecast: Since the removal of the 4¢/lb temporary voluntary allowance on Jan. 15, PVA tags have held steady at the posted price and are not expected to change until 1985. Paper industry usage should increase between 3% and 4% next year and could reach 16 million lb by the end of the decade.

Saltcake

Uses: Saltcake (sodium sulfate) is the main source of makeup sodium and sulfur values in kraft pulp mills.

Demand: In 1983, kraft pulp mills consumed an estimated 498,000 tons of saltcake, about 47% of the total consumption of 1.06 million tons. Mill usage in 1984 is expected to decrease slightly (less than 1%) to approximately 495,000 tons. Other major end-uses include detergents (41%) and glass manufacture (13%).

Sources: Sodium sulfate is produced from both natural deposits or as a byproduct in the manufacture of rayon, sodium bichromate, and hydrochloric acid. From 1980 to 1982, the share of natural sulfate dropped to 44% from 52%. In 1983, it increased slightly to 44.5% and is expected to remain at that level in 1984. There are three producers of natural sulfate: Great Salt Lake Minerals & Chemicals, Kerr-McGee, and Ozark-Mahoning (Div. of Pennwalt). Over the past year or so, three byproduct producers closed their plants, while one brought a new plant onstream at year-end 1983. The major synthetic producers now include Akzona, Allied Chemical, Avtex, Climax Chemical, Diamond Shamrock, and Lithium.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, tight to market; 1979, market to tight.

Pricing: 1984, $99/ton, f.o.b. producing plant; 1983, $99/ton; 1982, $79-$94/ton; 1981, $68-$79/ton; 1980, $60-$68/ton; 1979, $47-$52/ton; 1978, $35-$45/ton.

Forecast: Total sodium sulfate production in 1984 is expected to increase about 4%, although byproduct sulfate output should rise about 10%, while natural production drops about 2.5%. The long-term prospect for pulp mill saltcake consumption depends on the extent of chlorine dioxide substitution in the first bleaching stage. The effluent from ClO_2 generators contains sodium and sulfur values that can be used in place of purchased saltcake. As the economy continues to improve, mill demand in 1984 could rise another 5,000 tons or so. Imports from Canada, which dropped sharply in 1983 (to 272,000 tons), are expected to decrease further this year to about 240,000 tons. Total U.S. imports are also slated to decrease in 1984 to about 265,000 tons, based on seven-month shipments of about 155,000 tons.

Sodium chlorate

Uses: The major use of sodium chlorate is for onsite generation of chlorine dioxide (ClO_2).

Demand: In 1983, pulp mills consumed an estimated 288,000 tons of Na_2ClO_3—85% of total apparent consumption of about 339,000 tons. Mill demand should increase in 1984 to about 296,000 tons. Other uses are chlorates (6%), uranium processing (4%), agriculture (3%), and miscellaneous applications (2%).

Sources: The major producers of sodium chlorate—derived from electrolysis of an acidified sodium chloride solution—include ERCO Industries, Georgia-Pacific, KemaNord Bleaching Chemicals, Kerr-McGee, Occidental Chemicals, Olin, and Pennwalt. Smaller facilities are operated by Brunswick Chemical, HO Process, Huron Chemicals, and Pacific Engineering. Canadian imports in 1983 accounted for about 32% of total chlorate demand.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, tight.

Pricing: 1984, $420/ton, f.o.b. works, freight equalized; 1983, $420/ton; 1982, $420/ton; 1981, $375/ton; 1980, $345-$375/ton; 1979, $335-$345/ton.

Forecast: As predicted last year, KemaNord Bleaching Chemicals (a division of Swedish-based KemaNobel) acquired Occidental Chemicals' Columbus, Miss., plant, which is slated for a 56% expansion by mid-1985. Imports from Canada in 1983 were 108,000 tons (86,000 tons in 1982), while imports in 1984 should reach the 130,000-ton mark (76,000 tons by the end of July).

Sodium hydrosulfite

Uses: Sodium hydrosulfite is used as a bleaching agent for mechanical and deinked pulp.

Demand: In 1983, the paper industry used an estimated 17,000 tons (excluding hydrosulfite produced *in situ* from Borol). Apparent consumption was about 50,000 tons. The textile industry is the largest consumer of sodium hydrosulfite (used in vat dyeing) and accounts for about 40% of total demand. Other end-uses include clay bleaching (20%) and miscellaneous (2%).

Sources: There are still only two sodium hydrosulfite producers in the U.S.: Olin and Virginia Chemicals (a Celanese subsidiary). This year, Virginia completed major expansion programs at its plants at Bucks, Ala., and Leeds, S.C. Borol solution is produced solely by Morton-Thiokol's Ventron Div.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1984, 60¢-63¢/lb (proprietary blends), f.o.b. producing point; 1983, 60¢/lb; 1982, 60¢/lb; 1981, 55¢-60¢/lb; 1980, 43.5¢-55¢/lb; 1979, 41.5¢-43.5¢/lb; 1978, 39.5¢-41.5¢/lb.

Forecast: Merchant sodium hydrosulfite consumption in 1984 may reach 17,500 tons, while apparent consumption increases to about 57,500 tons. Hydrosulfite produced via Borol is expected to hit the 8,000-ton level (100% basis), compared with the 7,050 tons used by the mills in 1983.

Starch

Uses: Starches are the workhorse binders for coating mills and are also used as surface sizes, internal additives, and as adhesives for corrugated containers.

Demand: In 1983, the paper industry used an estimated 2.8 billion lb, unchanged from its requirements in the previous year, out of a total consumption of 4.45 billion lb. (In 1982, total demand was 4.3 billion lb.) In 1984, mill usage will go up slightly to 2.9 billion lb, while total demand rises to about 4.7 billion lb. Food, brewing, and textiles are other major end-uses for starch.

Sources: Producers are listed in the *P & P Buyers Guide 1981* (p. 32). About 90% of the starch used in the paper industry is cornstarch.

Availability: Unmodified: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market. Modified: 1984, market; 1983, market; 1982, market; 1981, tight to market; 1980, tight.

Pricing: Unmodified: 1984, $15.71-$17.68/100-lb bags, truckloads, f.o.b. plant; 1983, $11.50-$15.96/100 lb; 1982 $11.50-$12.25/100 lb; 1981, $11.25-$14/100 lb; 1980, $9.50-$10.50/100 lb; 1979, $9-$10/100 lb; 1978, $8/100 lb. (For bulk prices, deduct $1.25/100 lb.) Modified starch prices vary for each grade, but generally follow price trends of unmodified starch.

Forecast: An increase of more than 53% in farm acreage in 1984—brought about by the abandonment of the Payment-In-Kind program—has resulted in a "strong normal" crop of an estimated 7.5 billion bushels. Thus, prices began to fall in September (to $17.68/100 lb) after rising monthly since January. Another 50¢/100 lb drop is expected by year-end, with a decrease of another $1/100 lb in early 1985. Mill demand should increase between 3% and 4% in 1985 to a predicted 3 billion lb, while total consumption goes up about 2% to 4.8 billion lb.

Styrene-butadiene latex

Uses: The bulk (about 90%) of the styrene-butadiene latex (SBL) employed by the paper industry is used as a coating binder, the remaining 10% is accounted for by paper saturation (masking tape and wallpaper).

Demand: In 1983, an estimated 235 million lb of SBL were used by the paper industry, up about 7% from the previous year. On the other hand, total latex consumption recovered sharply to 700 million lb (up 11.5%), resulting in a slight decrease in the industry's share of the total to 33.5%. In 1984, paper and board usage is expected to rise to 248 million lb, while total demand increases to 800 million lb, reducing the industry's share to 31%. The major end-use (50%) is in carpetbacking and integral foam, followed by other textile applications and adhesives.

Sources: About 85% of the estimated 915 million lb of annual capacity in the U.S. is shared by four major suppliers (in descending order of capacity): Dow Chemical, Polysar, Reichhold Chemicals, and General Tire.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1984, 75¢-79¢/lb (effective May 1, 1984); 1983, 71¢-75¢/lb; 1982, 71¢/lb; 1981, 65¢-71¢/lb; 1980, 59¢/lb; 1979, 53¢/lb; 1978, 40¢-43¢/lb.

Forecast: Monomer costs have been fairly steady during 1984, although styrene prices slipped about 1¢/lb in midsummer. Currently, lists for both styrene (35¢/lb) and butadiene (32¢/lb) are being discounted about 2¢/lb. Little change is anticipated in 1985, but freight costs are expected to rise significantly next year (about 10%). Thus, the next boost in SBL tags (expected in May) will be from 5% to 8%.

Sulfur

Uses: Sulfite pulp mills consume the bulk of the sulfur used by the pulp and paper industry. Some sulfur is also used directly in kraft pulp mills.

Demand: Pulp mills used less than 1% of the total sulfur consumed in 1983, requiring about 97,000 metric tons. (Total consumption of Frasch and recovered sulfur was about 9.9 million tons.) The bulk of the sulfur purchased is for agchems, petroleum refining, rubber, plastics, inorganic chemicals, and other miscellaneous applications.

Sources: The share of elemental sulfur produced in 1983 via the Frasch route vs that from refineries and sour-gas production dropped to 39.5% (60% in 1981). However, it is expected to increase to 43% in 1984. Major Frasch producers include Duval, Freeport Sulphur, and Texasgulf. Major suppliers among the more than 60 firms recovering sulfur include Amoco, Atlantic Richfield, Chevron Chemical, Exxon Chemical Americas, Getty, Mobil Chemical, Pursue Gas, Standard (California and Indiana), Texaco Chemical, and Union Oil.

Availability: 1984, market to slightly tight; 1983, market; 1982, market; 1981, tight to market; 1980, tight; 1979, very tight.

Pricing: 1984, $124 to $131/metric ton, crude, bright, f.o.b. Gulf Coast ports; 1983, $131 to $124/metric ton; 1982, $138.75 to $132.50/metric ton; 1981, $131.35 to $138.75/metric ton; 1980, $103.31 to $109/metric ton; 1979, $70.60/metric ton; 1978, $61.50/metric ton. Prices of both Frasch and recovered sulfur rose in 1984. In the third quarter, the f.o.b. Tampa, Fla., price for Frasch went up again to $145.14/metric ton, following a boost in March to $137.76/metric ton. The Gulf Coast recovered tag also rose earlier this year to $131.36/metric ton. With the $9.84/metric ton discount on Frasch still in effect, the differential with recovered sulfur has decreased to about $4/metric ton from the $20/metric ton prevailing in 1981.

Forecast: The recovery by the fertilizer industry in 1984 should result in a 15% to 16% increase in total sulfur consumption to an estimated 11.4 million metric tons. Thus, selling prices should continue to rise and are expected to go up about 5% in 1985. Usage by the pulp and paper industry is also expected to rise in 1984 to about 110,000 metric tons.

Titanium dioxide

Uses: Both rutile and anatase grades of titanium dioxide (TiO_2) are used by fine paper and board mills as filler and in coating.

Demand: In 1983, mill demand for TiO_2 recovered to an estimated 197,000 tons out of a total apparent consumption of about 839,000 tons. In 1984, mill usage should exceed the 215,000-ton level as total demand rises 10%. The largest end-use is by the paint industry (50%), followed by plastics (12%), rubber, and ceramics.

Sources: There are now five TiO_2 producers in the U.S. (in descending order of capacity): E.I. DuPont, SCM, American Cyanamid, Kerr-McGee, and Gulf + Western. SCM acquired G+W's Ashtabula, Ohio, plant in 1983 and is expanding it by about 22%. Kerr-McGee's smaller expansion came onstream in the third quarter of 1984.

Availability: Anatase: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market. Rutile: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market.

Pricing: Anatase: 1984, 70¢/lb, delivered; 1983, 70¢/lb; 1982, 70¢/lb; 1981, 58¢-70¢/lb; 1980, 57¢/lb; 1979, 53¢/lb. Rutile: 1984, 75¢/lb, delivered; 1983, 75¢/lb; 1982, 75¢/lb; 1981, 63¢-75¢/lb; 1980, 57¢/lb; 1979, 59¢/lb.

Forecast: Following a 5¢/lb hike on July 1, TiO_2 market prices finally matched the posted levels (in effect since late 1981). This was the third boost in 1984. The previous increases were instituted in April and January. As the economy continues to improve, there could be a further 5% to 6% hike in 1985.

Other major chemicals

Alum: Total alum demand has been virtually steady for the fifth year in a row, although bulk liquid prices finally rose on Jan. 1, 1984—the first hike since July 1981. The 9% boost brought lists to $145/ton in the North and $137/ton in the South. If raw material and freight costs continue to increase, there may be another boost in early 1985.

Casein: The list price of industrial-grade casein is still at $1.365/lb and is expected to hold there to the end of 1984.

Polyethylene: Low-density, extrusion-coating grade resin had dropped to 37¢/lb at the beginning of 1983, but moved up to the range of 40¢-42¢/lb in midyear and remained at that level until late summer of 1984. The high end of the range has held steady, but the low end dropped to 38¢/lb in August.

Polyvinyl acetate: List prices for polyvinyl acetate coating-grade emulsions went up 4¢/dry lb at the beginning of June, bringing the posted tag to 71¢/dry lb (about 36¢/lb, 50% basis) for bulk, tanks, f.o.b. works. The price boosts were attributed mainly to continuing increases in the cost of vinyl acetate monomer (VAM).

Rosin sizes: Rosin usage by the mills (100% basis) should reach an estimated 320 million lb in 1984 as more mills switch from dispersed grades to paste grades. Prices for 70% pale material have held steady at $36/lb since early 1983.

Wet-strength resins: List prices of natural trona, unchanged since November 1982, rose $6/ton on June 1, 1984 to $90/ton, f.o.b. Wyoming mines. However, a temporary voluntary allowance (TVA) of $11/ton has been in effect since late February—a $4/ton reduction from the $15/ton TVA introduced in October 1983. Synthetic sodium carbonate is still being listed at $132/ton, f.o.b. Syracuse, N.Y.

The posted prices for wet-strength resins, unchanged since July 1, 1982, rose about 7% early in 1984. Polyamide-epichlorohydrin (PEC) prices (12.5% solids) are now listed at $25.09/100 lb ($2/lb) on a dry basis), while urea formaldehyde (UF) is priced at $21.40/100 lb and $15.30/100 lb, respectively, for 35% and 25% solids content. (UF dry-weight price is 61¢/lb.) A 6% hike is expected some time in 1985.

Canadian chemical use to rise in '84 as selling prices continue moving up

■ Recovery has continued in 1984 for the Canadian pulp and paper industry despite production setbacks from labor/management disputes. Following production increases in 1983 of 13% and 8% for pulp and paper production, respectively, output in the first quarter of 1984 was depressed by a two-month lockout of the British Columbia industry.

Chemical demand strengthened in the second and third quarters as the industry ran at higher rates. Increased demand and better mill profitability spurred chemical suppliers to raise prices around midyear. Indications are that chemical consumption in Canadian mills will reach new highs in 1984.

At the end of July, total pulp production was 5% higher than in the first seven months of 1983. Most of the increase relates to mechanical pulps, which grew 11%. Chemical pulp output rose only 0.2%. The B.C. lockout contributed to a 7% decline in bleached softwood kraft, which was partly offset by a 23% increase in eastern-based bleached hardwood kraft.

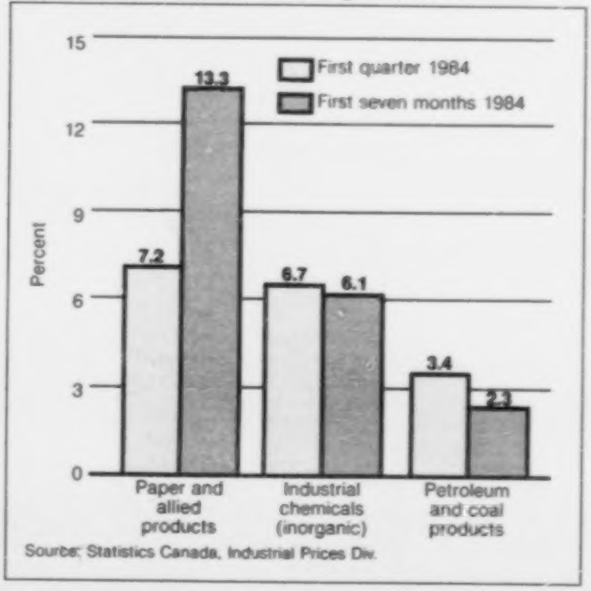
Paper production during the first seven months was 9% above the 1983 pace. The largest gain (21%) occurred for groundwood printing and specialty types. Newsprint output rose 7%, whereas gains of 10% to 12% were recorded for book and writing papers and paperboards. Mill inventories of paper were down 17%, and pulp inventories were down 24%.

The inorganic chemicals price index rose 6.1% by July 1984 (Figure 3), reflecting improved demand in mills and other industries. Discounting has subsided considerably and is mainly confined to caustic soda. Over the year, market prices for caustic soda rose about 20% via hikes on Jan. 1 and Oct. 1. Increases of about half that size are forecast for early 1985, although product will still be discounted from list. Chlorine prices rose 5% on July 1 and are close to list price. A hike in the list could occur in early 1985.

In early 1984, market prices for sodium chlorate were unchanged from 1982 levels. A price hike scheduled for early 1984 was rescinded because of resistance from mills. However, by midyear mills were showing improved performance, and a 4.4% market price hike was established. ERCO, QueNord, and BCM Technologies are expanding chlorate plants, and a new chlorate producer—Alby Klorat Div. of Swedish Match—is scheduled to open a plant at Valleyfield, Que., in early 1986.

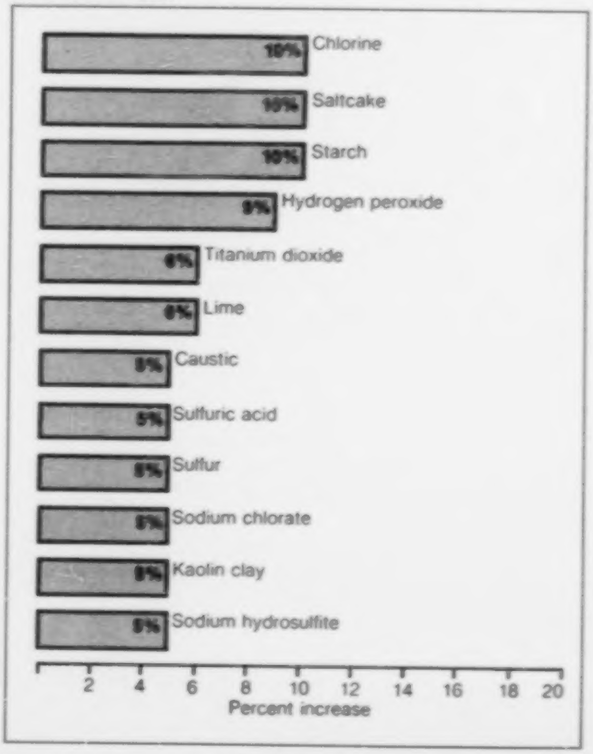
Hydrogen peroxide list prices rose 10% in June, reflecting movement in the U.S. where most product is sourced for the Canadian market. Peroxide growth pros-

FIGURE 3: **Canadian price index changes for 1984.**



Source: Statistics Canada, Industrial Prices Div.

FIGURE 4: **Projected Canadian price increases for major chemicals in 1985.**



pects have enticed two firms to plan new production plants so that Canada will have domestic supply by 1986. DuPont Canada's Maitland, Ont., facility will not only serve the eastern Canadian market, but export to the U.S. as well. FMC Canada's plant at Squamish, B.C., will target western Canada's pulp industry for its sales. ■

DEFINITIONS OF SURVEY AVAILABILITY TERMS:

Very tight—On allocation; demand significantly greater than supply.
Tight—Demand slightly greater than supply.
Market—Supply/demand in balance or excess capacity available.

CHEMICAL SURVEY: CANADA

Aluminum sulfate

Uses: Alum usage is split about 50:50 between the precipitation of rosin size and pitch control/water treatment applications.

Demand: In 1983, paper mills consumed 108,000 tons, or 57% of total alum consumption. In 1984, total mill usage is expected to increase to 115,500 tons (55.5% of total demand), of which about 56,000 will be used for sizing. Total alum consumption in 1983 was 190,000 tons (up 11% from the previous year), and in 1984 should reach 205,000 tons. Municipal water and sewage treatment applications now account for about 35% of the total, with the balance going into pigments and other miscellaneous end-uses.

Sources: There are now three major Canadian alum producers—Alcan Smelters & Chemicals, Allied Canada's Allied Chemical Div., and United Chemicals. The latter operates three plants in western Canada (since midyear) and has overtaken Alcan as No. 2 producer. In fourth spot is C-I-L Sulfur Products West (formerly Inland Chemicals) with two plants, while Borden Chemical has a small plant in Manitoba, Que.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market to tight.

Pricing: 1984, $146.97/ton, liquid (17% Al_2O_3), bulk, f.o.b. works; 1983, $131.54-$139.70/ton; 1982, $131.54/ton; 1981, $100.70-$119.75/ton; 1980, $86-$100.70/ton; 1979, $79-$86/ton.

Forecast: Alum prices rose about $7.25/ton at the beginning of this year, the previous $8.15/ton boost occurring on Apr. 1, 1983. No further hike is expected in 1984. Mill usage should grow between 2% and 3%/year through 1988, while total demand should increase at about 4%/year primarily due to the expected 8% to 9% growth in sewage treatment uses.

Caustic soda

Uses: NaOH is used in the extraction stages of kraft or sulfite bleach plants, for hypochlorite makeup, and in sulfite pulping.

Demand: In 1983, pulp mills consumed about 983,000 tons of caustic (61% of total domestic demand), with 737,000 tons used in the bleach plant. An additional 246,000 tons were employed for pulping applications. In 1984, demand should rise between 5% and 6% to 1,037,000 tons (767,000 tons for bleaching end-uses). The next largest end-uses are in the production of propylene oxide and alumina, which last year accounted for 7% and 5.5%, respectively, of total demand.

Sources: Caustic is a coproduct of chlorine production. See the chlorine profile for major producers.

Availability: 1984, market; 1983, market; 1982, tight to market; 1981, very tight to market; 1980, very tight; 1979, tight; 1978, tight.

Pricing: 1984, $417/ton, 50% solution, bulk, f.o.b. works, freight equalized; 1983, $417/ton; 1982, $381-$417/ton; 1981, $293-$381/ton; 1980, $195-$293/ton; 1979, $183-$195/ton; 1978, $175-$183/ton.

Forecast: Caustic lists—still unchanged since April 1982—should remain at the $417/ton-level until mid-1985, although off-list tags were slated to rise last month to about $413/ton. The recovery in chemical pulp production in the second half of 1984 is expected to continue next year, resulting in an estimated mill demand in 1985 of about 1,100,000 tons.

Chlorine

Uses: Chlorine's major use by the pulp and paper industry is as a bleaching agent in kraft and sulfite pulp mills. A smaller use is for onsite hypochlorite makeup.

Demand: In 1983, the pulp and paper industry used about 548,000 tons of chlorine, up about 9% from the 502,000 tons consumed in 1982. In 1984, demand by mills is expected to increase about 4% to 571,000 tons, while the industry share of total demand rises slightly to 39%. The major end-use for chlorine, ethylene dichloride (EDC) production, should account for 41% of the total in 1984.

Sources: Chlorine is produced along with caustic by the electrolytic reduction of brine. Major chloralkali producers include C-I-L, Canadian Occidental Petroleum, Dow Chemical Canada, FMC Chemicals, and PPG Industries.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight; 1978, tight.

Pricing: 1984, $344.75/ton, bulk, f.o.b. works; 1983, $308.45-$344.75/ton; 1982, $254-$281.25/ton; 1981, $225 to $254/ton; 1980, $195-$225/ton; 1979, $163-$195/ton; $1978, $145-$163/ton.

Forecast: The traditional annual hike in chlorine tags did not take place in 1984, the last boost occurring July 1, 1983. The first hike last year was on Jan. 1. No changes are expected much before mid-1985. Chlorine usage by the mills will decrease over the longer term as ClO_2 use grows, but not as quickly as originally projected. Only one mill has replaced the theoretical maximum (70%) of its first-stage chlorine requirements, while most mills operate in the 6% to 8% range. Four mills are replacing between 25% and 30% of their chlorine needs. In the immediate future, chlorine demand by the mills should grow about 3%/year to 1988.

Hydrogen peroxide

Uses: The pulp and paper industry employs hydrogen peroxide (H_2O_2) as a bleaching agent for mechanical and chemical pulps. It is also used in the bleach plant as a partial replacement for ClO_2.

Demand: In 1983, Canadian mills used an estimated 6,400 tons of H_2O_2—about 72% of total peroxide consumption. In 1984, mill usage is predicted to reach 7,700 tons—70% of total demand. Other end-uses include textiles (10%), water treatment (5%), and miscellaneous applications (15%).

Sources: All of the peroxide consumed in Canada is still imported. The major importers are C-I-L (from FMC Corp.), Du Pont Canada (from its U.S. parent), and Interox Canada (via its new Toronto terminal). European product is handled by several distributors.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market to tight; 1979, market; 1978, market.

Pricing: 1984, 58.7¢-65¢/lb (effective July 1, 1984), bulk, 70% solution, f.o.b. Toronto/Montreal; 1983, 58.7¢/lb; 1982, 52.5¢/lb; 1981, 52.5¢/lb; 1980, 44¢-47.5¢/lb; 1979, 41¢-44¢/lb; 1978, 36¢-41¢/lb.

Forecast: The 6.3¢/lb hike in July was the first price change in 18 months. The next boost should occur around mid-1985. Consumption of H_2O_2 by mills could reach the 17,000-ton level by 1988.

Hydrosulfites, borohydride solution

Uses: Almost all newsprint mills bleach groundwood with hydrosulfite purchased or generated onsite via the Borol process.

Demand: In 1983, the pulp/paper industry used an estimated 7,400 tons (100% basis) of merchant sodium hydrosulfite and an added 9,100 tons Borol (12% active borohydride basis). Vat drying of cotton accounted for about 10.5%.

Sources: No hydrosulfite is produced in Canada. VirChem Canada imports blended hydrosulfites from its U.S. parent, Virginia Chemicals (a subsidiary of Celanese), while various distributors import product from Europe. Morton-Thiokol's Ventron Div. supplies Borol.

Availability: Hydrosulfite blends: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: Blended: 1984, 71¢-72¢/lb, delivered, eastern Canada; 1983, 69.4¢-71¢/lb; 1982, 69.4¢/lb; 1981, 59¢-64¢/lb; 1980, 51.4¢/lb. Nonblended: 1984, 68¢/lb; 1983, 61.2¢-68¢/lb; 1982, 61.2¢-71.5¢/lb; 1981, 61.2¢-66.4¢/lb; and 1980, 56¢-66.4¢/lb.

Forecast: Mill usage should rise 13.5% to 8,400 tons (100% basis) in 1984. Last year, the increase was only 330 tons. Annual demand growth for the next four years should average 2%. Borol usage decreased in 1983 about 1%, but should grow about 13% in 1984 (to 10,300 tons). However, the average annual increase to 1988 will be only 1% to 2%.

Kaolin

Uses: Kaolin is used by paper and paperboard mills as a coating pigment (58%) and as a filler (42%).

Demand: In 1983, coating applications consumed an estimated 130,000 tons of kaolin clay, while an additional 90,500 tons were used as a filler, representing about 86% of total kaolin demand. In 1984, usage should increase to 143,000 tons and 104,500 tons, respectively. The increase in imports last year, the first since 1980, has continued in 1984. At the halfway mark, U.S. shipments were annualized at 289,000 tons, compared with the 274,000 tons imported in 1983.

Sources: U.S. suppliers are listed in *P & P Buyers Guide 1984* (p. 157). Since 1981, imports from the U.K. have been minimal, albeit 1983's 1,550 tons were almost twice those imported in 1982.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market to tight.

Pricing: Water-washed No. 1 coating grade, 1984, $255/ton, f.o.b. Georgia; 1983, $255/ton; 1982, $218/ton; 1981, $215-$218/ton; 1980, $208 to $215/ton; 1979, $194 to $208/ton. Dry-ground, air-floated filler grade: 1984, $58/ton (same basis); 1983, $58/ton; 1982, $60/ton; 1981, $47-$60/ton; 1980, $43-$47/ton; 1979, $35-$43/ton.

Forecast: Mill demand should rise about 5% for both coating and filler pigments over the next four years. Consumption by 1988 should be 173,500 tons and 127,000 tons, respectively.

Lime

Uses: Kraft mills purchase lime to supplement calcium requirements in the recovery cycle.

Demand: In 1983, pulp mills purchased an estimated 243,000 tons of lime (12.5%) out of a total consumption of just under 2 million tons. In 1984, mill lime usage should rise by 7,000 tons. The largest lime consumers are iron and steel mills, which used 595,000 tons in 1983, up slightly from 1982's 569,000 tons. Other lime end-uses, in descending order of volume, include chemicals, uranium recovery, nonferrous smelters, water and sewage treatment, and sugar refining.

Sources: There are still nine merchant lime producers in Canada, although two plants have changed hands. Domtar has left the lime business, recently selling its remaining facility in Beachville, Ont., to BeachviLime (Dofasco's captive supplier). Late in 1983, Domtar's Joliette, Que., plant was sold to Jolichaux. BeachviLime is now the largest firm in the country (more than 1 million tpy), followed by Steel Bros. Canada, and Jolichaux.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight to market; 1978, market.

Pricing: Quicklime: 1984, $63.60/ton, f.o.b. Ontario producing point; 1983, $59-$63.60/ton; 1982, $55-$59/ton; 1981, $46-$55/ton; 1980, $40.98-$46/ton; 1979, $34.98/ton.

Forecast: The percentage of total lime consumption accounted for by mill purchases will decline over the long term, particularly as more mills opt for oxygen enrichment in the lime kiln. Meanwhile, through 1988, merchant lime usage by the mills should increase between 1.5% and 2%/year. The partial recovery in steel output in 1983 reversed the slide (since 1981) in total lime demand, which rose about 1.5%, compared with the 8.5% drop in 1982. Demand should grow 5% in 1984, while steel industry usage rises to 613,000 tons. Exports continue to drop—about 170,000 tons expected in 1984.

Saltcake

Uses: Saltcake is used by kraft pulp mills for sodium and sulfur makeup.

Demand: In 1983, pulp mills used 279,000 tons—about 79% of total sulfate demand (353,000 tons). Recovery in the market pulp area resulted in a 10.5% boost from 1982. Mill consumption should rise another 10.5% in 1984.

Sources: Most sodium sulfate comes from the Glauber's salt deposits in Alberta and Saskatchewan. Byproduct sulfate capacity is only 12% of total. Major producers include Alberta Sulphate, Hudson's Bay Mining & Smelting's Francana Minerals Div., Midwest Chemicals, Ormiston Mining & Smelting, and Saskatchewan Minerals. The latter firm closed its Gladmar (50,000 tpy) plant in May 1983 after reopening the former Sybouts Sodium Sulphate facility in May 1982. SaskMin's small (40,000 tpy) Bishopric unit is still on indefinite standby since January 1983. The two byproduct sulfate producers are Courtaulds and Ontario Paper, both in the East.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1984, $81/ton, bulk, saltcake, f.o.b. mine; 1983, $75-$81/ton; 1982, $70-$75/ton; 1981, $55-$70/ton; 1980, $50-$55/ton; 1979, $50/ton; 1978, $45-$50/ton.

Forecast: There has been no change in the price of saltcake since April 1983 and none is expected in 1984. If pulp markets continue to improve, an 8% to 10% boost could occur by the second or third quarter in 1985. Over the long term, more effluent recyling from ClO_2 generators will reduce the amount of saltcake purchased by mills.

Sodium chlorate

Uses: Sodium chlorate is used in chlorine dioxide generators.

Demand: In 1983, pulp mills used an estimated 208,500 tons of sodium chlorate, about 95% of total chlorate consumption (219,500 tons). The turnaround in pulp markets increased mill demand last year by about 14%. Uranium leaching, the only other significant end-use for chlorate, required about 10,000 tons in 1983.

Sources: Canadian merchant producers of sodium chlorate are BCM Technologies, Canadian Occidental, ERCO Industries, QueNord, and PPG Industries. BCM's new plant near Windsor, Ont., went onstream in last year's third quarter. Swedish Match has received Canadian government approval to build a plant in Montreal, while QueNord (a KemaNobel subsidiary) plans to double capacity of its Magog, Que., facility by 1986. The three remaining captive producers are B.C. Chemicals, St. Anne Chemical, and Saskatoon Chemicals.

Availability: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, tight.

Pricing: 1984, $435/ton, bulk, f.o.b. works, freight equalized; 1983, $435/ton; 1982, $410/ton; 1981, $365/ton; 1980, $310-$330/ton; 1979, $310-$330/ton; and 1978, $250-$281/ton.

Forecast: Pulp mill demand for sodium chlorate is expected to increase by about 8% to 225,000 tons in 1984 and then continue to grow about 3%/year to 1988. No boost in the list price, effective Jan. 1, 1983, is expected before next year.

Starch

Uses: The paper industry's major use of starch (about 80%) is at the size press, with some employed in coating. Wet end applications account for a small quantity.

Demand: In 1983, the paper industry used an estimated 76,000 tons of starch, about 15% of total consumption; this should increase by about 9,000 tons in 1984. The production of corn sweeteners accounted for about 67.5% of total demand in 1983. Other end-uses include food starches, corrugated and other adhesives, ore flotation, and other applications.

Sources: Most of the starch used by mills comes from corn. Major cornstarch producers include Casco (new joint venture with John Labatt, 70% owned by Canada Starch), Nacan Products, and St. Lawrence Starch. International Grain Products, a small cornstarch producer, also supplies wheat starch.

Availability: Unmodified: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market. Modified: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market.

Pricing: 1984, native pearl (unmodified), $21.77/100 lb., truckload, bags, f.o.b. Toronto, Ont./Montreal, Que.; 1983, $19.78-$21.77/100 lb; 1982, $19.25-$20.69/100 lb; 1981, $19.25/100 lb; 1980, $14.59 to $19.25/100 lb; 1979, $14.59/100 lb; 1978, $12.60-$14.59/100 lb. Modified starch prices follow the price trend for unmodified starches.

Forecast: During the past year, starch prices fluctuated from $20.69/100 lb at the beginning of the year to $19.78/100 lb on Apr. 4 and then rose to $21.77/100 lb on Aug. 8. Tags have remained steady since then but may go up about 10% in 1985. The 85,000-ton demand by the mills expected in 1984 will increase their share to 16% of total starch usage (an estimated 531,000 tons). Average annual growth in mill demand to 1988 should be about 1.5%.

Sulfur

Uses: Sulfite pulp mills that do not purchase liquid sulfur dioxide burn sulfur to produce gaseous SO_2 for sulfite and bisulfite cooking liquor makeup. ClO_2 generation and other uses in the bleach plant consume small amounts.

Demand: In 1983, an estimated 209,000 metric tons of sulfur were purchased by the Canadian pulp and paper industry, accounting for about 28% of total consumption (about 746,000 metric tons). In 1984, the industry's usage is expected to increase about 4.5% to 218,000 tons, 28% of total demand. The largest end-use for sulfur is sulfuric acid production (65%), followed by carbon disulfide, rubber vulcanization, and other miscellaneous applications.

Sources: All sulfur produced in Canada is recovered, either from sour-gas operations or petroleum refineries. Major producers include Amoco, Canadian Occidental Petroleum, Canterra Energy, Chevron Standard, Dome Petroleum, Petrogas Processing, Shell, and Westcoast Transmission.

Availability: 1984, market; 1983, market; 1982, market; 1981, tight to market; 1980, tight; 1979, tight.

Pricing: 1984, crushed, slate, or molten, $83.64/metric ton, f.o.b. producing point; 1983, $78.72 to $83.64/ton; 1982, $73.80 to $81.18/ton; 1981, $59.98 to $74.48/ton; 1980, $32.76 to $59.98/ton; 1979, $24.82 to $29.79/ton.

Forecast: Although sulfur list prices have not increased in 1984, the average selling prices for North American shipments have gone up since the beginning of this year. By June the average had risen to $68.80/metric ton from the $60.68/ton prevailing in January and the $52.64/ton recorded for December 1983. Despite an estimated 4.5% increase in pulp/paper industry consumption this year, mill usage over the longer term will drop; demand by 1988 could fall to 180,000 metric tons.

Sulfuric acid

Uses: The major use of sulfuric acid (H_2SO_4) is in the kraft pulp mill for chlorine dioxide generation.

Demand: In 1983, 262,500 tons of sulfuric acid were consumed by Canadian pulp mills out of a total of 3.2 million tons. Pulp mill use in 1984 is expected to increase to 278,000 tons. Phosphoric acid production, the major end-use, accounted for about 56% of the total in 1983, up from 54% the previous year. Other end-uses include agricultural chemicals, petroleum refining, soaps and detergents, and viscose rayon.

Sources: Major merchant producers (in descending order of capacity): Inco Metals, Cominco, Canadian Electrolytic Zinc (Noranda), Kidd Creek Mines, and C-I-L Sulfur Products West (formerly Inland Chemicals). C-I-L also markets acid produced by Inco and Kidd Creek, as well as that not required captively by Falconbridge Nickel. Noranda markets acid from CEZ and Gaspe Copper Mines. Esso Chemicals Canada, International Minerals & Chemicals, and Western Cooperative Fertilizers are the major captive acid producers.

Availability: 1984, market; 1983, market; 1982, market; 1981, tight to market; 1980, market to tight; 1979, tight to market; 1978, very tight.

Pricing: 1984, 66° Baume, $94.35/ton, bulk, f.o.b. producing points, eastern Canada; 1983, $89.63 to $94.35/ton (effective Dec. 15, 1983); 1982, $84.55/ton; 1981, $69.31 to $84.55/ton; 1980, $60.87 to $69.31/ton; 1979, $52.40 to $60.87/ton.

Forecast: Pulp mill acid consumption rose 5% in 1984 (compared with an 8% hike last year), but mill demand to 1988 is only expected to grow, on the average, about 1%/year. Sulfuric acid list prices have remained steady throughout 1984, but an 8% to 10% boost is predicted for 1985.

Titanium dioxide

Uses: About 90% of the anatase titanium dioxide (TiO_2) used by the paper industry is employed for fine paper applications, with the balanced used in paperboard.

Demand: Mill usage in 1983 increased 13% to 9,400 tons, 13.5% of a total demand of 69,400 tons. In 1984, mill demand should reach 10,500 tons. Last year, total consumption increased between 6.5% and 7% as the major end-use for TiO_2—the paint industry—recovered slightly (6%) from 1982. Its share went down to 55.5% of the total (from about 56%), while plastics applications account for about 17%.

Sources: There are two domestic producers—NL Chemicals Canada and Tioxide of Canada—with a combined capacity of 88,000 tons.

Availability: Untreated anatase: 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: 1984, $80-$85/100 lb, untreated anatase, delivered, truckload, bags; 1983, $80/100 lb; 1982, $74.50-$80/100 lb; 1981, $69-$74.50/100 lb; 1980, $59-$69/100 lb; 1979, $48.50-$59/100 lb (Note: bulk slurry carries a 50¢/100 lb premium.)

Forecast: List prices for TiO_2 finally rose 5¢/lb on Sept. 10, having remained steady since Jan. 18, 1982. However, a 2¢/lb temporary valuation allowance (TVA) was in effect for nine months in 1983. Since then, product was moving at list prices. The new tag is expected to remain in force for at least the first half of 1985. Mill usage is expected to increase about 6%/year over the next four years. Total demand will grow between 6% and 7% during that time.

Containerboard quality changes as

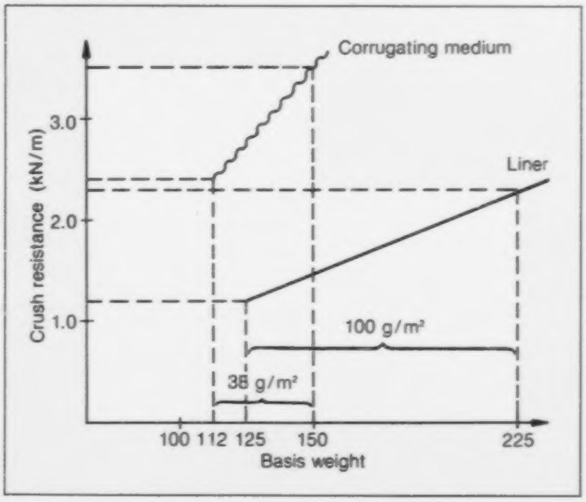
Carton palletizing and preprinting require crush-resistant and smooth-surfaced containerboard that is best produced with multifourdriniers

By K. FLINKMAN and T. WILLNER

■ During recent years, new trends in the packaging industry have led to new quality requirements for linerboard. Although the U.S. is the largest producer of containerboard, these new trends are more prevalent in Europe than in North America. Two major changes are occurring. First, it has become more important to measure the top-to-bottom compressive strength of the container itself, rather than the strength of containerboard base materials alone. Second, changes in purchasing habits for consumer goods have caused a new advertising medium to emerge—the container package itself.

CRITERIA CHANGES. Containerboard has been traditionally used only as a transit packaging medium to give the goods necessary protection from the environment. The bursting strength of the linerboard and the corrugating medium has been the main quality criteria to be met. The printing quality has been indifferent—nothing better has been required because the main purpose of the print was to identify the contents of the package to the transporter or to the warehouse manager. There has been very little use for additional colors.

FIGURE 1: **Crush resistance vs basis weight (Source: Finnboard).**



Changes in the distribution system have caused more transportation to take place on pallets. Boxes now remain stacked instead of being handled individually. Thus, users of corrugated boxes require boxes that can withstand stacking while still protecting goods against the environment.

Additional measuring methods that would better relate to the top-to-bottom compressive strength of the container have been studied. Such tests are the edge crush test (ECT) for corrugating medium, and the ring crush test (RCT) or STFI test for the board components.

It has now been widely accepted that the main criteria for box evaluation should be the strength of the finished box and not, for example, the mullen strength of the linerboard. This allows for a more economical composition of corrugated board to be used. Crush resistance of containerboard increases with the basis weight, but significant differences exist between the effects of liner and corrugating medium basis weights. Figure 1 shows that for kraft liner, an increase of 1 kN/m in crush resistance is achieved by adding 100 g/m² of liner at low basis weights. The higher the basis weight of the liner, the smaller the increase in crush resistance.

For corrugating medium, the increase in crush resistance is linear—1 kN/m increase in crush resistance can be achieved by adding only 38 g/m² of corrugating medium. This factor has made the use of heavier corrugating mediums possible in Europe.

CHANGES IN GRAPHICS. Increasingly, product transport packages are also used as consumer packages, especially in discount stores or in cash-and-carry-type markets. Some typical goods sold this way include small appliances, tools, toys, and home computers. In addition, the drink and ready-made food trades are users of secondary packaging as an advertising medium. More and more purchasing decisions today are not made until the consumer is at the store. This has led to increasingly dramatic displays for special offers in supermarkets. Both a strong visual impact and an instant brand identification must be provided by the packaging.

Mr. Flinkman and Mr. Willner are with Tampella Ltd.'s Machinery & Engineering Group Marketing, Tampere, Finland.

packaging makes new demands

The use of white top liner (either of bleached pulp or clay coated), and preprinting of linerboard have made better graphics possible. The market share of white or mottled top linerboard in Europe is currently 18% of the corrugated board market, and it is expected to grow even more. More coated linerboard is also on the market as the new or rebuilt machines with on-machine coaters of the latest technology have started operation. The latest preprinting development is to have one station to print a white base on the board. The increased use of colors in linerboard printing in Europe is shown in Table 1.

TABLE 1: **Percentage of printed corrugated board.**

	% of tonnage			**Expected annual increase 1981-86**		
	U.K.	**Fed. Rep. Germany**	**France**	**U.K.**	**Fed. Rep. Germany**	**France**
Unprinted	35	35	20	+1	+1.5	+1.5
One color	35	34	60	−1	+2	+0.5
Two colors	20	20	10	+1	+3.5	+2
Three colors	7	7	7	+7	+4	+8
Four colors	3	4	3	+4	+5	+7.5
Total	100	100	100	+1	+2.5	+2

The preprint not only improves the graphics, it also results in stronger corrugated board—possibly allowing a reduction in sheet weights. Preprinting also makes it possible to use accurate product bar codes on the package so separate coding labels will not be necessary.

The increased use of corrugated boxes as an advertising medium has led to new requirements for linerboard. To have better graphics in several colors, the base material must also be better. A greater need for surface smoothness also exists if the board will be clay coated. The uniformity of the sheet both in basis weight and moisture can become a problem with older board machines. To keep the register in preprinting, it is necessary to have a low and consistent shrinkage factor of the liner sheet.

The sheet must be uniform to get the full benefit from modern, high-speed converting machines. Optimum sheet moisture for the converter is about 8%. A bad moisture profile or a moisture difference between the two liners causes warping and impairs the runability of the corrugator.

CHANGES IN BOARD MACHINE DESIGN. How have these changes in the containerboard market affected the design of board machines? The new requirements for linerboard have created new types of board machines that have one thing in common: the wet end of the machines is composed of several formers and, in many cases, of multiple fourdriniers.

It is evident that a top ply produced with a fourdrinier has a superior formation compared with one produced with a secondary headbox. Even while the continuous development of headboxes has improved the

TABLE 2: **Measurements of MD/CD strength ratio from random samples of various machines.**

Mill	**Machine wet end**	**Tensile strength ratio MD/CD**
A (Sweden)	Fourdrinier and secondary headbox	2.6
B (Finland)	Fourdrinier and secondary headbox	2.9
C (United States)	Fourdrinier and secondary headbox	2.6
D (Sweden)	Four fourdriniers	2.2
E (Sweden)	Two fourdriniers	1.8

TABLE 3: **Recent multifourdrinier wet ends for manufacturing containerboard.**

Company	**Startup year**	**Product**	**Supplier of board machine**
ASSI, Frövifors Bruk AB, Sweden	1981	Liquid packaging board, kraft linerboard	Tampella
INPACSA SA, Spain	1983	Test liner, white top liner	Emua (Tampella licensee)
Manville Forest Products Corp., United States	1985	Bottle carrier board, liquid packaging board, kraft linerboard	Tampella
SAPPI Ltd., South Africa	1985	Liquid packaging, kraft linerboard	Tampella
Nettingsdorfer Papierfabrik AG, Austria	1984	Kraft linerboard, corrugating medium, liquid packaging medium	Voith
Chesapeake Corp., United States	1985	Linerboard	Voith

design of the secondary headbox, a fourdrinier allows better control and adjustment of sheet properties.

ADVANTAGES OF MULTIFOURDRINIERS. The MD/CD strength ratio of the board is lower (and it is also adjustable) with a fourdrinier (Table 2). This improves the RCT in the cross direction. The sheet uniformity is increased by going to multi-ply machines, as the random variations are reduced by $1/\sqrt{n}$, where n is the number of plies. When using several fourdriniers, each ply can be controlled separately for best overall uniformity independent of the operating conditions.

Multi-ply forming on separate formers allows for the use of different consistencies at each forming unit. Fourdriniers can be designed for very large ranges in drainage capacity. In this way there is high flexibility in using different consistencies for different drainage characteristics of various furnishes and for desired end results of the sheet. For instance, for the top ply, a low consistency can be used for a good formation and a smooth surface.

Different furnishes for each ply can be used in a multi-ply machine. For best smoothness, hardwood kraft may be used for top liner while high-yield pulp or recycled furnish is used in the middle layer. Separate whitewater systems can easily be used in multifourdrinier machines. This means a savings when bleached pulp is used for top liner. It also prevents contamination of outer plies with wax or "stickies" when using recycled furnish in the middle layer.

The multifourdrinier concept is by no means a new idea. For more than 20 years, machines in Europe have been making multi-ply board with several fourdriniers. Their use, however, was limited to slow-running boxboard machines. With the changing requirements of the containerboard maker, multifourdrinier containerboard machines are now in operation.

Replacing a secondary headbox with a minifourdrinier can immediately lead to considerable improvements. Figure 2 shows a wet end of a Swedish machine, which makes two-ply liquid packaging board and has been in operation since 1976.

Machines with three or four fourdriniers also exist. Figure 3 shows a typical wet end of such a machine. This machine is for SAPPI Ltd. of South Africa and it will produce liquid packaging and kraft linerboard at an ultimate production rate of 990 tpd. The wire width is 295 in. (7.5 m). In order from bottom to top, the plies are produced with a base fourdrinier, an On-Top-Wire XC (extra capacity), and an On-Top-Wire. Machines of this type have already run at speeds of more than 1,700 fpm. Several multifourdrinier machines will come onstream in the next few years in several countries (Table 3).

MULTI-PLY FORMING SOLUTIONS. One of the potential problems that has previously limited the use of multifourdrinier machines is the ply bond. The ply bond is affected by the plies' moisture at the point of couching and by the amount of fines at the surface of the sheets. The correct moisture range has been thoroughly investigated and is now well under control.

The couching technique is simple. The couch roll is a drilled roll with a large, open area. The point of couching is between a table roll and a suction box, which follows the couching point. The positions of the couch roll

FIGURE 2: **Swedish machine making two-ply liquid packaging board.**

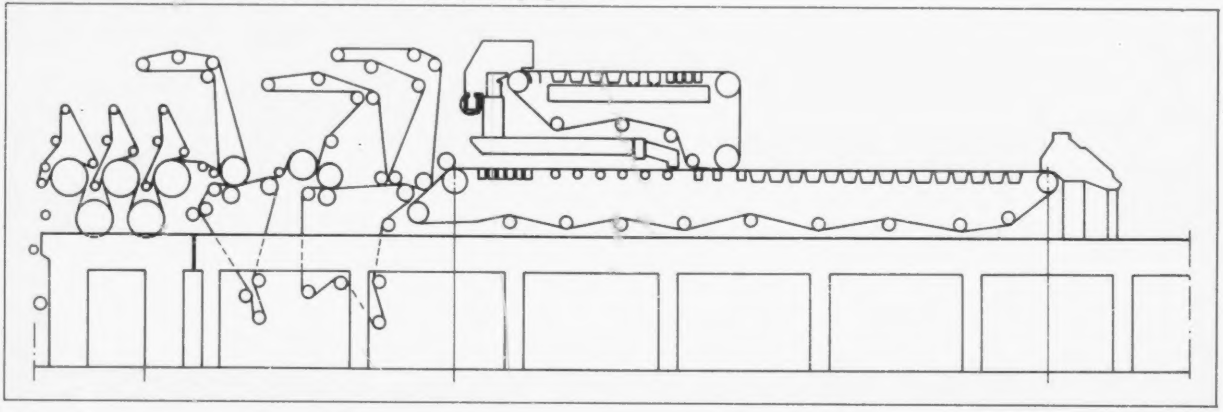
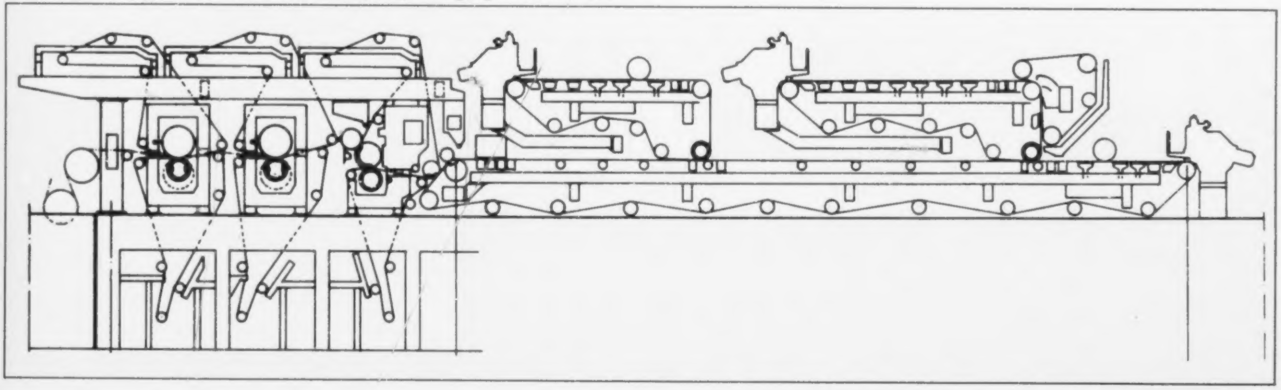


FIGURE 3: **SAPPI's machine for liquid packaging and linerboard.**



and the following inside wire roll must be adjustable. Modern electric-drive systems keep the speeds of the different wires identical.

In order to make use of the fines in the sheet, it is not advisable to couch two wire-sides together. A preferred location for a twin-wire former, such as the On-Top-Wire XC, is after the base fourdrinier headbox. This position allows more flexibility in moisture control before the couching point. Retention chemicals can also be used for the control of fines.

One common way to adjust ply bond is with refining. Increased refining gives a higher ply bond, but in certain cases it may decrease the board machine's production.

To secure ply bond in all conditions, many board makers have installed starch showers at the couching points. A typical amount of starch used per application is about 6 lb/ton of paper at a consistency of 2% to 3%.

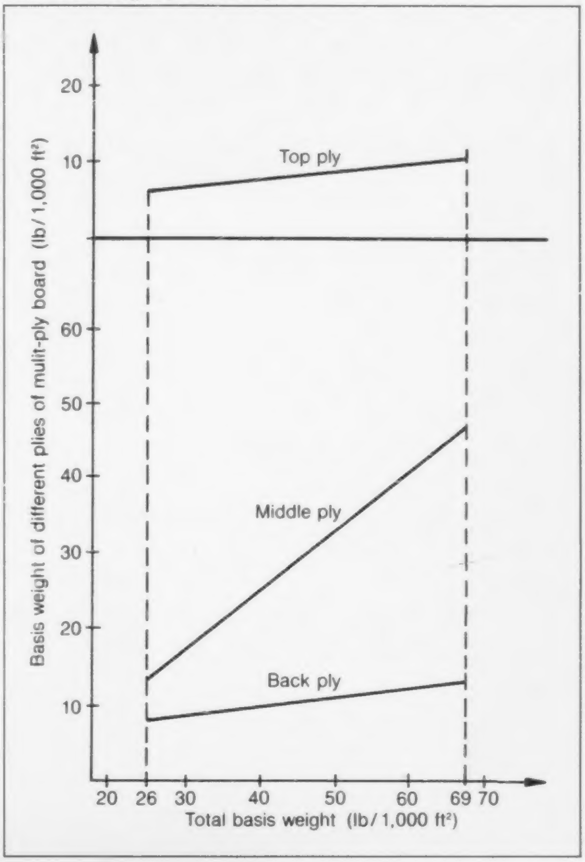
Because the outer plies often use more expensive furnish—it may be bleached, more refined, etc.—it is common to hold the basis weight of the top and bottom liner constant and vary the middle layer according to the total basis weight (Figure 4). This may cause some problems in designing headboxes as the middle-layer headbox is designed for a nearly constant flow, whereas the headboxes for outer layers will run at constant basis weight throughout the entire speed range and vary the fiber flow accordingly. Great attention must be paid not only to the headbox design, but also to the design of inlet piping, screens, pumps, etc. In sum, attention must be paid to the complete short circulation system.

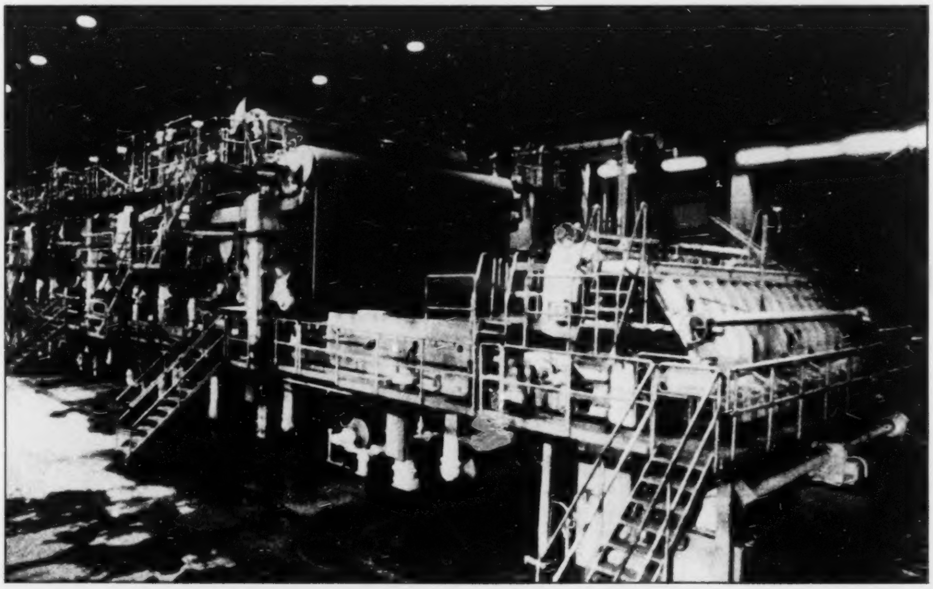
Modern process control systems allow automatic control of a multi-ply board machine. The control system is used for controlling the uniformity of the sheet, and it can also be used to help in startups, grade changes, etc.

CONCLUSION. Multifourdrinier machines enhance most of the qualities that modern trends in board making require. Any number of plies can be formed separately using different furnishes if necessary. Fourdrinier forming gives the container the highest top-to-bottom compressive strength and the best surface smoothness.

The ply bond is controlled by refining or adding starch with showers between the plies. Modern process control systems can help in the operation of a combination of multiformer machines, but the operation and maintenance of individual fourdriniers remain the same. Good maintenance of the equipment and well-trained personnel are still the most important factors in multifourdrinier papermaking. ■

FIGURE 4: **Basis weight of different plies of multi-ply board vs total basis weight (lb/1,000 ft²).**





Liquid packaging board machine at ASSI, Frövifors Bruk AB, Sweden.

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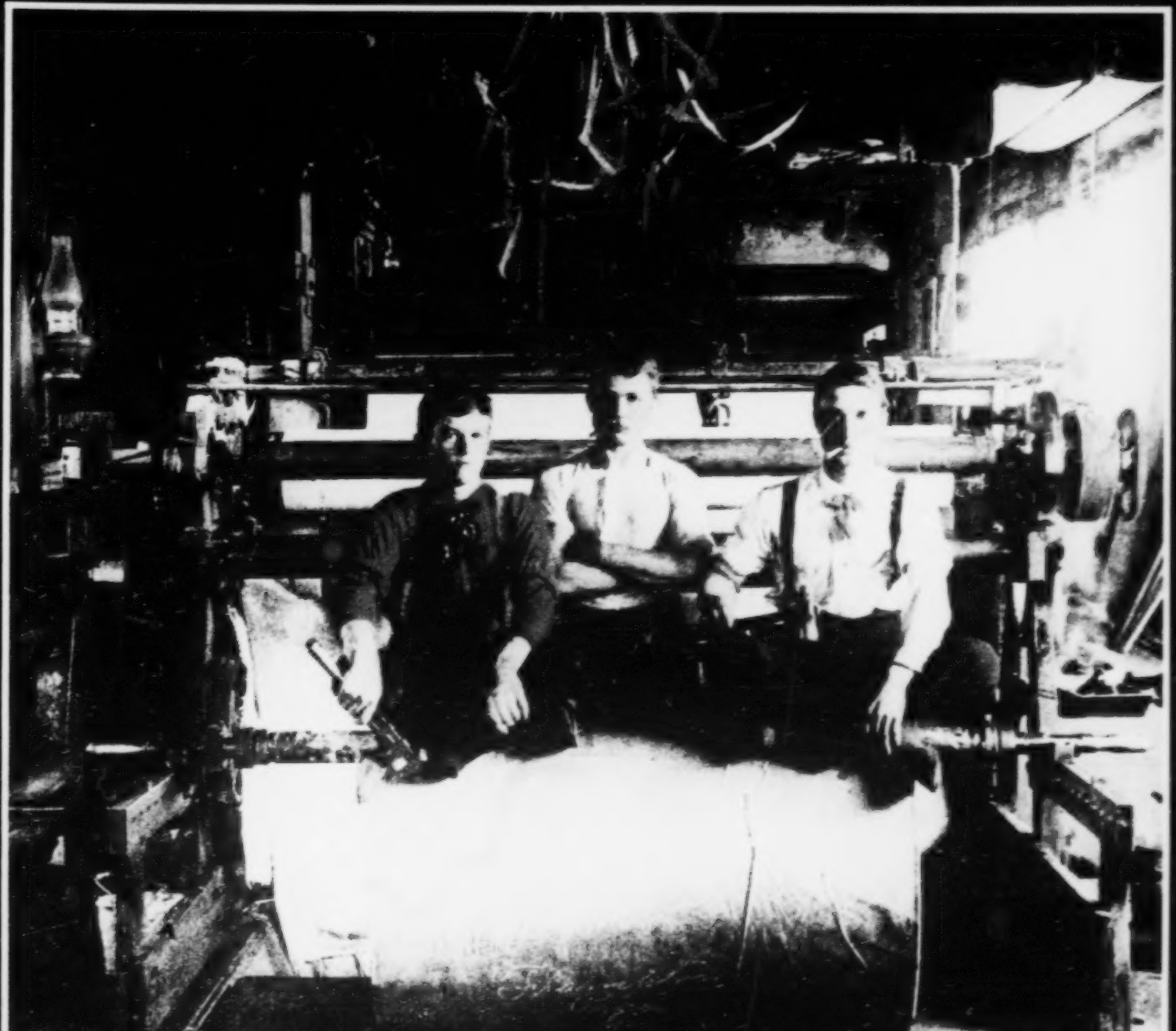

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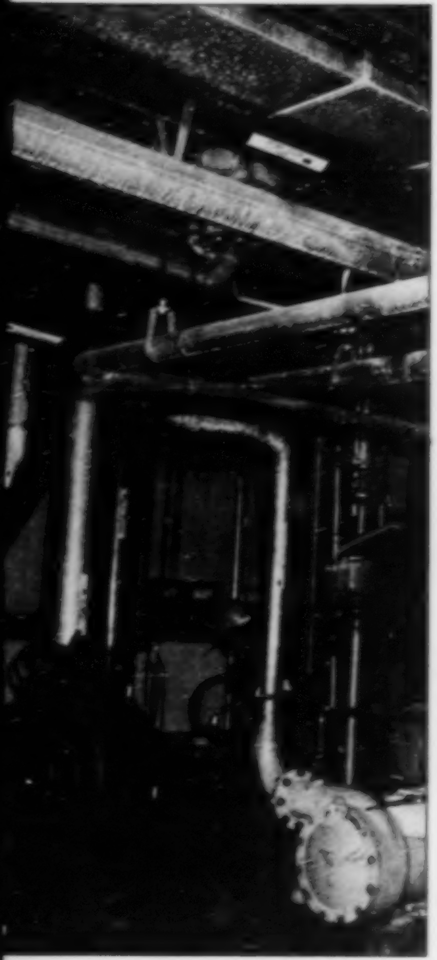

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COVER: *Christmas 1912. The No. 2 paper machine crew poses at Crown Zellerbach's Camas, Wash., mill. (Photo courtesy Crown Zellerbach.)*

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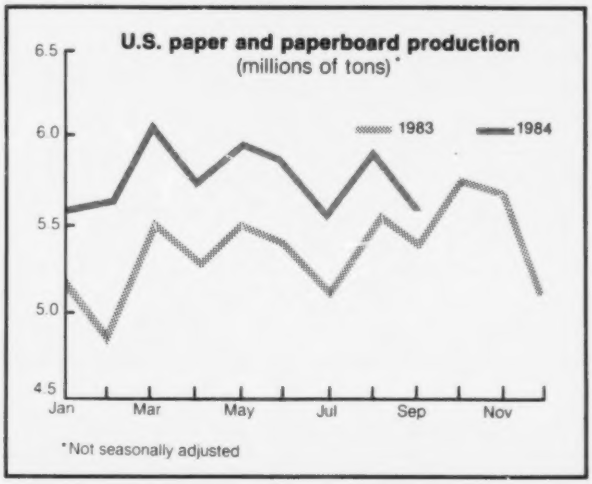
MONTH IN STATISTICS

U.S. paper and paperboard production in September and throughout the entire third quarter showed a less than normal decline for the usually slow summer season, according to the American Paper Institute. If paper and paperboard production continues near the third-quarter rate during the remainder of the year, the 1984 total would exceed 69 million tons, establishing a new high.

Among major grades, nearly all paper grades showed relatively strong production trends in September and none showed significant weakness. The year-to-date packaging and industrial paper production rate of 5.85 million tpy was 5% above the year-earlier rate and close to the record high of 5.9 million tpy set in 1979. The containerboard grades continued to operate at close to capacity levels during the third quarter of 1984, with the production of milk carton grade up 5.8% over its 1983 rate.

Canadian newsprint shipments were slightly off last year's level, while inventories held by U.S. consumers increased 14.5% over September 1983 and jumped 57.8% from the August level.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION¹					
Newsprint	September	447	7.7	5,561	8.2
Uncoated groundwood (s)	September	133	5.6	1,601	6.7
Coated paper (s)	September	513	9.4	6,213	11.9
Uncoated free sheet (s)	September	741	6.2	9,222	6.3
Unbleached kraft packaging and industrial (s)	September	313	−7.0	3,900	3.3
Tissue	September	386	0.3	4,853	1.7
Total paper	**September**	**2,806**	**3.6**	**34,782**	**6.7**
Kraft linerboard, unbleached	September	1,378	4.4	16,299	9.0
Semichemical medium	September	436	10.4	5,227	11.9
Bleached paperboard	September	328	7.2	4,107	4.9
Recycled paperboard	September	621	2.0	7,971	8.9
Total paperboard	**September**	**2,854**	**4.7**	**34,802**	**8.7**
Total paper and paperboard*	**September**	**5,660**	**4.2**	**69,584**	**7.7**
PULP, WASTEPAPER & FIBER²					
Total woodpulp production	August	4,790	7.4	56,066	7.7
Market pulp production	August	593	4.8	6,810	5.5
Wastepaper consumption at paper/board mills	August	1,350	12.0	15,852	10.5
Pulpwood consumption (cords)	August	7,368	−0.4	86,121	3.6
CONVERTED PRODUCTS STATISTICS³					
Corrugated box shipments (billion ft²)	September	21.605	3.3	201.672†	7.0
Containerboard inventories at box plants	Sept. 1	2,711	12.0		
INTERNATIONAL TRADE²					
U.S. paper imports (including products)	August	890	16.0	11,089	27.9
Imports of Canadian newsprint	August	696	20.4	7,690†	14.6
U.S. paper exports (including products)	August	357	−6.4	4,526	−1.7
Exports of unbleached kraft linerboard	September	177	13.0	2,146	−9.1
Exports of woodpulp	August	318	10.0	3,660	3.2
CANADIAN STATISTICS⁴ (metric thousand tons)					
Total newsprint shipments	September	734	−0.4	6,686†	8.1
Operating rates	September	92%	87%	91%	84%
Inventories held by U.S. consumers	September	1,480	14.5		
Woodpulp shipments (export only)	September	599	1.4	4,962†	−0.4
Operating rates	September	83%	84%	84%	85%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn. *Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

Newsprint: Market regains balance thanks to healthy demand

Statistics	**1983**	**1984e**	**1985e**
United States			
Production, 000 short tons	5,168	5,505	5,700
Capacity, 000 tons	5,748	5,927	5,954
Utilization rate, %	89.9	92.9	95.7
Apparent U.S. consumption			
000 tons	11,677	12,495	12,870
lb/capita	100.1	106.1	108.2
000 tons/$billion real GNP	7.60	7.63	7.62
Canada			
Production, 000 tons	9,354	9,915	10,262
Capacity, 000 tons	10,990	10,951	11,023
Utilization rate, %	85.1	90.5	93.1

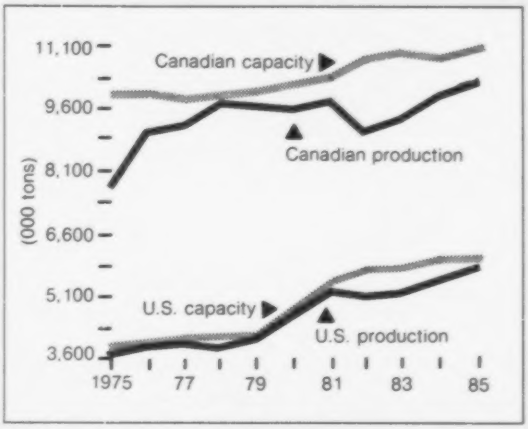
e = Estimated.

GRADE STRUCTURE: The majority of newsprint is intended for use by newspapers, with smaller volumes going to other end-uses such as newspaper inserts, government publications, comic books, and commercial printing. Offset printing represents about a fourth of the volume of newsprint consumed, with letterpress being the predominant printing method employed. Standard newsprint has a basis weight of 30 lb/3,000 ft², with some newsprint being made at up to 32 lb or as low as 28 lb or below. Some shift to 28-lb newsprint has occurred in the New England states.

PRODUCTION/CAPACITY: Newsprint demand began to recover strongly from the recession in the second half of 1983, and through September 1984 demand was running 9.5% ahead of 1983. U.S. output jumped 8.5% through the first three quarters of 1984 from the same period in 1983. Canadian production, hampered by reduced overseas markets, was up by a more modest 6.7%. Output in the final quarter of 1984 seemed destined to grow at a slower rate as publishers began trimming inventories for accounting reasons.

Canadian mills still supply about 57% of all U.S. newsprint. Canadian capacity dropped marginally in 1984 while U.S. capacity rose. The continued preference of U.S. publishers for U.S. suppliers, combined with the trend of Canadian mills to upgrade newsprint machines in order to make uncoated groundwood, indicates the long-term trend (of decreased Canadian presence in the U.S. market) seems likely to continue.

OUTLOOK: Demand should continue to grow at a healthy pace in 1985, barring a recession, but year-to-year increases like those recorded during most of 1984 will not persist. The U.S. economic recovery is clearly maturing, and newsprint demand is expected to rise about 3% after the 7% increase of 1984. This will lead to operating rates of almost 96% in the U.S. and about 93% in Canada, with capacity remaining flat. This should set the stage for an extremely tight supply/demand situation in 1986-88. Price increases have been announced for Apr. 1, 1985, which would bring the average eastern U.S. list to $517/short ton.



Top companies	Annual capacity (000 short tons) Canada	U.S.	Total	Capacity share (%)
1. Abitibi-Price	1,755	334	2,089	12.4
2. CIP Inc.	1,192	—	1,192	7.1
3. Bowater[1]	182	898	1,080	6.4
4. MacMillan Bloedel	981	—	981	5.8
5. Consolidated-Bathurst	970	—	970	5.7
6. St. Regis	—	811	811	4.8
7. Boise Cascade[2]	273	524	797	4.7
8. Kimberly-Clark[3]	373	420	793	4.7
9. Ontario Paper	790	—	790	4.7
10. Kruger Inc.[4]	789	—	789	4.7
11. Publishers Paper	—	577	577	3.4
12. Crown Forest	472	—	472	2.8
13. B.C. Forest Products	470	—	470	2.8

North American capacity (1984): 16.878 million tons
Capacity share of top five companies: 37.4%
Capacity share of top ten companies: 61.0%

1. Includes Catawba Newsprint (51% owned) and Calhoun, Tenn., mill; does not include Corner Brook, Nfld., mill sold to Kruger.
2. Boise Cascade: includes Boise Southern, DeRidder, La.
3. Includes Spruce Falls Power & Paper (50.5% owned).
4. Includes Corner Brook, Nfld., mill purchased from Bowater.

PRICING: Prices rose July 1, 1984 in the East to $485/short ton, but a Jan. 1, 1985 hike had to be postponed to April due to customer resistance. Prices in the West rose Oct. 1, 1984 to $485 (less 5%).

Price history is as follows: (U.S. East, contract, year-end) 1974, $235; 1975, $258; 1976, $285; 1977, $300; 1978, $320; 1979, $375; 1980, $400/$426; 1981, $453; 1982, $425; 1983, $454; 1984, $485.

MARKETS: Canadian producers supplied U.S. consumers with 57.4% of their newsprint in 1983, little changed from the 56.7% of 1982. In 1984 the percentage seemed to be returning to the 1982 level.

(News section continues on page 23)

CLOSURES

IP to permanently close Camden kraft mill

International Paper Co. has announced plans to permanently close its 255,000-tpy unbleached kraft paper mill at Camden, Ark., in April 1985. This would appear to complete the withdrawal of IP from production of unbleached kraft packaging grades with the shutdown of a 105,000-tpy machine at the company's Mobile, Ala., mill scheduled for early next year. And it would bring total announced U.S. major capacity withdrawals for unbleached kraft paper over the next several years to around 800,000 tons.

Mill manager Peter C. Redfern described the move as an "economic decision." Factors that were probably behind the decision included the need for major modernization expenditures at the Camden mill, the recent poor profitability of unbleached kraft paper, and an uncertain future for this grade because of plastic competition in the grocery sack market.

IP, however, said it would continue to run its four Bagpak Div. plants which make multiwall sacks (Camden, Ark.; Pittsburgh, Kans.; Wilmington, Ohio; and San Jose, Calif.) and its four Standard Products Div. plants which produce grocery, specialty bags and sacks and wrapping paper (Mobile, Ala.; Indianapolis, Ind.; Jackson, Tenn.; and Richmond, Va.). The company also will continue to produce bleached kraft packaging paper at its Mobile, Ala., and Moss Point, Miss., mills.

The mill has three machines (one 144-in. and two 192-in. trim) and a fairly modern pulp mill. Substantial modernization work, however, is reportedly required for the mill's low-pressure boiler system, which means that the facility must rely heavily on purchased rather than cogenerated electricity.

Capacity withdrawals. The shutdown of Camden would appear to bring total announced U.S. unbleached kraft paper capacity withdrawals over the next several years to 815,000 tons. This, of course, does not include smaller allocations of machine time from the production of unbleached kraft paper to the production of other grades, mainly linerboard.

The lastest American Paper Institute mill capacity survey pointed out that unbleached kraft paper capacity will decline from 4.09 million tons in 1982 to 3.84 million tons in 1986, with almost all of the 247,000-ton decrease due to the conversion of kraft paper machines to linerboard.

The most recent capacity withdrawals—the majority of which represent shutdowns or conversion to white paper production—were not included in the last survey.

The major factor causing the exodus has been the poor profitability of unbleached kraft paper grades, which performed particularly poorly during the last recession.

IP restructuring program. Shutdown of Camden represents the latest step in IP's massive restructuring of its southern kraft mills. The company shut down its Springhill, La., bleached paper and board mill in 1976 and then in 1979, sold its Panama City, Fla., linerboard and market pulp production mill.

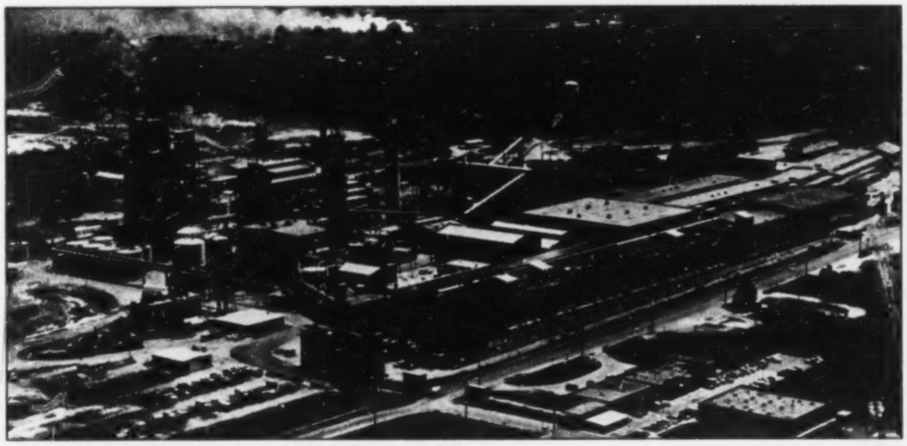
This was followed by the purchase of the Pineville, La., linerboard mill in 1979 and construction of the Mansfield, La., containerboard mill in 1981. IP recently converted its Georgetown, S.C., mill to bleached grades and has a similar program underway at its Mobile, Ala., mill.

In a recent newspaper interview, IP chairman, Edwin Gee said that the next mills on the company's list for modernization or closure are its Natchez, Miss., mill and its Moss Point, Miss., mill.

Major U.S. unbleached kraft paper capacity withdrawals.

Previously completed	**Mill**	**Capacity (short tpy)**	**Date**
Gulf States Paper	Tuscaloosa, Ala.	167,000	1978
Crown Zellerbach	Bogalusa, La.	140,000	1979
Boise Southern	Elizabeth, La.	105,000	1981
Manville Forest	West Monroe, La.	35,000	1981
St. Regis	Lufkin, Texas	100,000	1981
Total past withdrawals		**547,000**	
Recently announced			
Georgia-Pacific	Crossett, Ark.	157,000	1984
	Monticello, Miss.	158,000	1985
International Paper	Mobile, Ala.	135,000	1984-85
	Camden, Ark.	255,000	1985
Haindl Papier	Port Townsend, Wash.	110,000[1]	n.a.
Total future withdrawals		**815,000**	

1. Includes only current estimated kraft paper production.
Source: P & P estimates.



IP's unbleached kraft paper mill in Camden, Ark.

SALES AND EARNINGS

U.S. paper third-quarter profits up 66%

U.S. paper company earnings surged 66.3% in the third quarter compared to a year ago, and even overcame normal seasonal weakness to top their record second-quarter level by 7.8%, according to financial reports released by 27 companies. Forest products company profits were up 22.4% from a year ago, strengthened by their paper operations, but were off 35.1% from the second quarter, based on aggregate results for seven companies. Total U.S. paper and forest products profits for the third quarter were up 53.1% from a year ago on a 13.8% increase in sales.

Among factors helping profits of paper companies was continued strength in demand and prices for many grades, although some companies noted increased competitive pressure in uncoated white papers and market pulp.

International Paper Co.'s chairman, Edwin Gee, said, "Increased volume and prices resulting in higher profits in our industrial packaging area and in our pulp and paper segment are responsible for the dramatic rise in pretax operating earnings." IP posted earnings of $71.6 million in the third quarter, 7% higher than third quarter 1983 (which included a $44.5-million pretax gain from the sale of timberland). Sales hit $1.2 billion, a 9.4% increase.

Boise Cascade Corp. posted a 6.8% increase in sales and an 81.3% jump in earnings for the third quarter. John Fery, chairman and CEO, predicted that "the favorable trends for most paper grades should continue, although the environment for business papers and pulp is apt to remain highly competitive in the near term."

Coated paper strong. Coated papers continued to be one of the strongest segments of the paper industry, offsetting price weakness that developed during the period in uncoated paper grades. Burnell Roberts, chairman and CEO of Mead Corp., noted that white paper operations were led by a record performance at his company's Escanaba, Mich., coated publication paper mill. Consolidated Papers Inc.'s three coated printing paper mills ran at capacity, according to chairman and CEO George Mead.

Most companies reported sharply higher income from their paperboard and packaging operations from the depressed levels of a year ago. Temple-Inland Inc. reported an 89% increase in net income on a 7.2% increase in sales. Income from containerboard and corrugated box operations was up 341% from a year ago, while bleached paperboard operations income was up 151%.

Tissue remains competitive. Major tissue producers all posted increases in sales and earnings over last year's third quarter despite heated competition in most tissue markets. Kimberly-Clark Corp.'s earnings increased 21.1% on a 12.8% increase in sales compared to a year ago. Fort Howard Paper Co. posted a 47.5% increase in profits over a year ago, while Scott Paper Co. increased profits 38.5%. Chairman and CEO of Scott, Philip Lippincott, said earnings from sanitary tissue products were strong despite costs associated with the restart of a machine in Everett, Wash., and the introduction of several products.

Forest products. Forest products companies cited low prices and overproduction in reporting poor markets for wood products. Weyerhaeuser Co. net income was up 9.6% on an 11.3% increase in sales. President George Weyerhaeuser said earnings were down from the second quarter and attributed the drop to lower lumber prices and the impact of the strong dollar in export markets. Lumber output has exceeded demand, but the market apparently bottomed out in September, he said.

Champion International Corp. reported a jump of 64.5% in net income and an increase of 7.5% in sales over the 1983 third quarter. Chairman and CEO, Andrew Sigler, noted, "Our paper business is very good, but . . . our lumber and plywood operations continue to do poorly, and we don't see what's going to change those conditions."

U.S. paper and forest products companies' third-quarter results.

	Third quarter ($000)			
	Sales	Change 1984/83	Earnings[1]	Change 1984/83
Paper companies				
Bowater	$228,052	15.2%	$18,202	101.9%
Chesapeake	115,786	32.8	7,951	216.1
Consolidated	166,581	19.7	19,079	77.0
Crown Zellerbach	815,100	14.5	22,900	2.7
Federal Paper	157,009	19.0	12,227	442.9
Fort Howard	351,574	56.6	37,472	47.5
Glatfelter	70,024	13.8	8,142	78.2
GN Nekoosa	472,000	22.4	30,500	83.7
Hammermill	417,827	13.5	7,580	58.2
Int'l. Paper	1,187,500	9.4	71,600	7.0[2]
James River (7/29)	625,200	24.4	22,400	25.1
Jefferson Smurfit	169,095	12.7	6,753	166.4
Kimberly-Clark	904,600	12.8	52,700	21.1
Longview (7/31)	127,454	37.2	7,945	−3.8
Mead	708,100	11.6	48,200	85.4
Mosinee	48,599	40.5	2,062	9.7
Pentair	141,923	94.2	5,065	77.1
Scott	573,023	0.4	50,047	38.5
Sonoco	182,245	6.2	8,678	−14.7
SW Forest	203,113	11.4	4,100	n.m.
St. Regis	834,926	13.1	49,739[3]	156.7
Stone Container	318,418	130.4	13,760	675.2[6]
Temple-Inland	323,900	7.2	27,400	89.0
Union Camp	497,719	15.6	49,365	42.9
Wausau (8/31)	49,113	−2.7	1,544	12.8
Westvaco (7/31)	446,051	20.8	40,873[4]	174.0
Willamette	295,448	13.1	20,456	210.0[5]
Total	**10,440,398**	**17.3**	**670,567**	**66.3**
Forest products				
Boise Cascade	967,470	6.8	32,720	81.3
Champion Int'l.	1,131,150	7.5	40,222	64.5
Georgia-Pacific	1,880,000	9.9	64,000	4.9
Louis.-Pacific	312,700	14.2	7,000	59.1
Pope & Talbot	82,717	28.6	(589)	n.m.
Potlatch	249,089	7.8	11,173	3.7
Weyerhaeuser	1,393,054	11.3	58,290	9.6
Total	**6,016,175**	**8.2**	**212,816**	**22.4**
U.S. total	**16,456,573**	**13.8**	**883,383**	**53.1**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.
2. Includes pretax gain of $44.5 million in 1983 from sale of timberland.
3. Includes sales of assets plus charges incurred by upcoming merger.
4. Includes $22 million net charge from tax reserve release and write-off of assets.
5. Includes 1983 $4.1 million net income gain on sale of plant.
6. Includes sale of assets in 1984.

n.m. = not meaningful.

Canadian profits vault in third quarter

Third-quarter profits of Canadian pulp and paper companies surged 203.7% on a 17.0% increase in sales over the same period a year ago, according to results from 11 companies included in *P&P*'s survey. Profits totaled C$71.1 million in the third quarter, on sales of C$3.2 billion.

Eastern Canadian companies continued to perform more strongly than those in the West due to relatively strong markets for newsprint, uncoated groundwood, white paper, and paperboard grades. Western companies were hurt by their heavy dependence on depressed lumber markets and profits of British Columbia companies could come under further pressure in the fourth quarter from deteriorating market pulp prices.

Third-quarter results of Canadian paper companies.

	Third quarter (C$000)			
Paper companies	**Sales**	**Change 1984/83**	**Earnings[1]**	**Change 1984/83**
Abitibi-Price	C$546,300	37.0%	C$15,338	71.2%
B.C. Forest	274,800	21.3	2,100	n.m.
Canfor	282,800	11.6	(5,400)	n.m.
Con-Bathurst	389,900	16.1	20,000	166.7
Domtar	509,100	5.9	23,300	39.5
Donohue	102,900	15.1	6,800	172.0
Fraser	127,000	13.4	(2,900)	n.m.
Great Lakes	152,091	19.6	5,445	n.m.
Mac. Bloedel	603,000	21.3	7,500	1,150.0
Rolland	70,700	21.5	1,408	−53.4
Weldwood	136,300	−11.4	(2,447)	n.m.
Canadian total	**3,194,891**	**17.0**	**71,144**	**203.7**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.
(   ) = loss.   n.m. = not meaningful.

Abitibi-Price Inc. reported a 71.2% increase in net income over the 1983 third quarter and a 37.0% increase in sales. Earnings hit $15.3 million on sales of $546.3 million for the largest newsprint producer in North America.

MacMillan Bloedel Ltd. attributed its third-quarter profit of $7.5 million vs $600,000 a year ago to higher shipments and prices for newsprint, pulp and containerboard. However, Ray Smith, president of MB, said the earnings were "unacceptable" and added that the company can't continue to sustain the "high cost structure that exists in British Columbia" due to uncompetitive wage rates, timber harvesting costs and taxes. MB reported sales of $603.0 million, a 21.3% increase over the third quarter of 1983.

Canfor Corp.'s third-quarter report showed a net loss of $5.4 million vs a loss of $12.8 million a year ago on sales of $282.3 million. Peter Bentley, president and CEO, noted that despite relatively high housing starts lumber prices in the U.S. remained depressed during the third quarter. "The high value of the U.S. dollar continued to hamper offshore lumber exports, resulting in an oversupply for the North American market." He added that pulp shipments were at record levels during the quarter but pulp prices have weakened again due to the strong U.S. dollar.

LABOR

CPU ratifies contract at Thunder Bay

Canadian Paperworkers Union members at Great Lakes Forest Products Ltd.'s Thunder Bay, Ont., mill ratified a new three-year contract in October, following months of negotiations. The Dryden, Ont., mill strike has still not been settled, but talks are continuing, said a company spokesman.

The Thunder Bay settlement is similar to a three-year contract ratified at Abitibi-Price Inc. mills in June. It calls for pay hikes of 2.5%/4%/5% over three years, terms which have become the pattern for the industry in bargaining this year.

Operations resume at Neenah, Wis.

P.H. Glatfelter Co. resumed operations at its Neenah, Wis., paper mill on Oct. 15 after a 37-day strike by a local of the United Paperworkers International Union. Union membership voted on Oct. 13 to ratify the new two-year contract. The Neenah mill has the capacity to produce about 120,000 tpy of recycled printing and writing paper.

- A new three-year labor contract was ratified at **Scott Paper Co.**'s Chester, Pa., mill. It calls for cash payments to each employee of $500 the first year and $750 in each of the following two years. The contract became effective Sept. 28.

Port Angeles workers ratify contract

Striking members of the Assn. of Western Pulp & Paper Workers at Crown Zellerbach Corp.'s Port Angeles, Wash., mill ratifed a new five-year labor contract in November, ending a two-month strike by the paperworkers union (*P&P*, Nov., p. 29).

The first three years of the agreement are similar to a three-year contract ratified with the Employers Bargaining Council, representing Pacific Northwest mills of Georgia-Pacific Corp., Boise Cascade Corp. and Weyerhaeuser Co. The final two years of the CZ labor contract will be based on the West Coast industry's wage settlements in those years.

The EBC agreement calls for a $1,000 cash payment to each employee in the first year and wage increases of 4% and 4.5% in the last two years. It also introduces a new health-care plan which requires employee contributions for the first time.

- Members of the Assn. of Western Pulp & Paper Workers at CZ's Antioch, Calif., mill "overwhelmingly" rejected the company's final offer and no further talks were set as of the middle of November, the company said. The mill has been shut down since workers there walked off the job on July 27.

The Antioch rejection of the company's final offer came somewhat as a surprise since the union had ratified a similar agreement at CZ's Port Angeles, Wash., mill the week before .

SECOND SALARY SURVEY

A questionnaire in the August 1984 *P&P* asked readers for information on salaries, benefits, and job satisfaction; results are now in

Median income up 7% from last year

By KENNETH E. SMITH, Executive Editor

■ The December 1983 issue of *Pulp & Paper* (p. 48) reported the results of our first reader compensation/opinion survey. The survey was repeated this year, and readers were asked to complete a two-page, postage-paid survey form contained in the August 1984 issue of *P&P* (p. 76). The deadline for the return of these survey forms was Oct. 19. Responses were turned over to an independent data processing firm for tabulation, and the survey is now complete.

Last year's survey found that respondents were reasonably happy with their jobs despite the lingering effects of the recession. The median income of all respondents in 1983 was $41,000. Benefits averaged between $5,000 and $10,000. Last year 88.1% of all respondents said they liked their jobs. This year, median income jumped a healthy 7% to $44,000. Average value of benefits received by our respondents remained in the $5,000 to $10,000 range. Job satisfaction rose slightly, as 88.6% of all respondents said they liked their jobs.

The average survey respondent is male (96%), lives in the Southeast, works for a large (annual sales of more than $1 billion) wood products/pulp and paper manufacturer in mill operations, technical service, or engineering, and has a bachelor's degree in mechanical engineering, chemical engineering, or paper science and technology. The average respondent's stability seems to confirm a relatively high level of job satisfaction. Only 12% of all respondents changed jobs in the last three years. Average time with present employer is ten years.

Other interesting statistics are as follows:

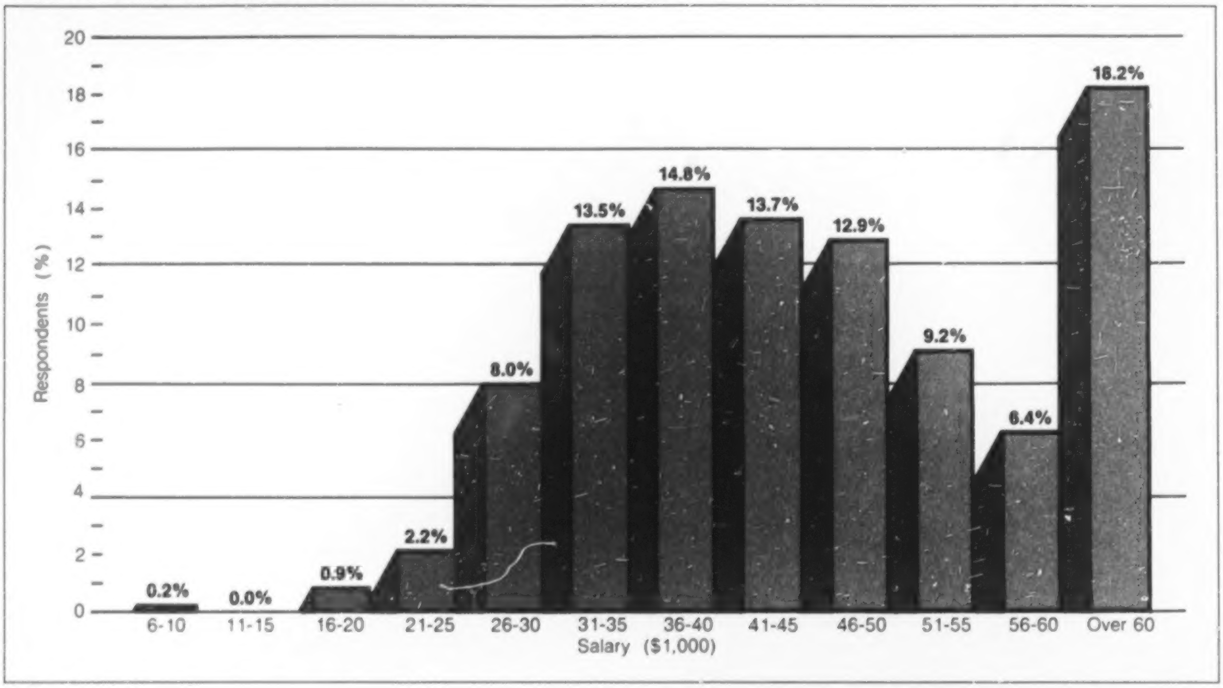
Compensation—

- Ten paid holidays and three weeks vacation are taken yearly on average
- An average of two salary increases in the past three years were received
- The last pay increase received by respondents averaged 7%
- 87.9% of all respondents are not paid overtime
- 92.8% normally receive annual salary reviews based on merit/performance (56.2%), cost-of-living index (3.5%), or both (28.4%)
- The average respondent has not had a promotion in the last three years.

Personal—

- 99.5% of all respondents work full-time; only 1.2% are self-employed
- 79% work for a wood products/pulp and paper manufacturer; 13.6% are consultants or suppliers to the industry
- 45 hours is the average respondent's workweek
- 50.5% work for companies with annual sales greater than $1 billion
- 64.9% of the respondents have at least team or unit management responsibility
- 17.1% work in mill/plant operations; 14.4% work in engineering design; and 14.2% work in technical service/quality control
- The average respondent's work experience since leaving school is between 10 and 14 years
- 56.9% live in either the Southeast (34.7%) or the Midwest (22.2%)
- 32.4% are between 31 and 40 years old; 58.8% are between 31 and 50 years old
- 86.7% have at least a bachelor's degree
- 26.2% have advanced degrees
- The most popular bachelor's degrees among the respondents were earned in mechanical engineering (16.7%), chemical engineering (14.4%) and paper science/technology (13.1%)
- 70.6% belong to a technical or professional society
- Average respondent has been with his present employer for ten years; the majority of respondents

FIGURE 1: **Income distribution of respondents.**



(61.2%) have had no more than two employers in their careers
- 60.5% have been in the pulp and paper industry all their careers.

Morale—
- On a scale of 1 (bad) to 5 (good), 60.6% rank their job morale at least a 4 (above average)
- 88.6% say they like their jobs
- 84% would stay in the paper industry if they changed jobs
- 88% feel their companies listen to their input and value their experience.

SURVEY RESULTS. Tables 1 through 19 present survey findings on compensation as compared with a number of variables including degree, discipline, work type and experience, size and type of employing organization, and supervisory level. This year 6.2% of our respondents were Canadian. Data for Canadian respondents have been broken out in Tables 17 through 19. Tables 1, 2, and 8 present the corresponding data for U.S. respondents only. All other tables contain data pertaining to all respondents.

The median income for Canadian respondents is $37,000. Reported value of average benefits was between $5,000 and $10,000. Median income of Canadian respondents, who represented only 3.6% of all respondents, in 1983 was $38,000. It should be kept in mind that respondents were asked to convert their salaries to U.S. dollars. Therefore, it is not clear if this decline in median income is due to the strengthening dollar or to other factors.

Income figures reported in all tables were obtained by adding any bonuses or additional income reported by respondents to their reported gross salaries. Survey respondents were asked to estimate the value of all benefits received by them as part of their compensation

TABLE 1: **Salary distribution of U.S. respondents.**

	Salary ($1,000)		Change
	1984	1983	(%)
Lower decile	30	28	7
Lower quartile	36	34	6
Median	44	41	7
Upper quartile	55	52	5
Upper decile	70	65	7

TABLE 2: **Employee benefits, U.S. respondents.**

Benefits value ($1,000)	Respondents (%)	
	1984	1983
0 to 1	0.4	0.5
1 to 2	3.2	4.2
2 to 3	4.7	6.7
3 to 4	7.0	7.7
4 to 5	4.9	6.8
5 to 10	31.2	32.4
10 to 15	25.1	21.8
15 to 20	10.9	10.0
20 to 50	12.0	9.0
>50	0.7	0.8

TABLE 3: **Benefits of all respondents.**

	Respondents (%)	
Benefit	1984	1983
Medical insurance	92.7	95.9
Life insurance	91.3	92.8
Profit sharing	57.9	26.6
Retirement pension plan	86.1	88.1
Company car	41.1	11.1
Bonus plan	36.9	23.9
Stock option plan	34.9	48.7
Dental insurance	47.0	80.8
Travel budget	16.5	24.8
Education allowance	27.0	49.6

TABLE 4: **Income and type of employing organization, all respondents.**

	Income ($1,000)						
Employing organization	Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Change in median '83/'84 (%)	Respondents (%)
Academic	39	39	45	45	47	15	0.2
Government	8	8	31	31	51	−3	0.2
Wood/pulp/paper—engineering	30	36	45	58	68	9	13.5
Wood/pulp/paper—manufacturing	30	35	44	54	70	7	65.4
Consulting firm	32	42	51	58	70	1	5.6
Self-employed consultant	20	50	60	111	111	42	0.4
Wood/pulp/paper—supplier	30	36	45	55	71	0	8.1
Wood/pulp/paper—converter	22	33	42	58	80	4	3.2
Other	29	37	45	60	89	9	3.5

TABLE 5: **Income and principal work function, all respondents.**

	Income ($1,000)						
Principal function	Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Change in median '83/'84 (%)	Respondents (%)
Administration	34	46	58	82	122	16	10.2
R & D	31	37	45	55	66	9	9.2
Consulting	28	38	50	60	70	6	3.6
Engineering design	30	35	43	53	64	4	14.4
Teaching/academic	39	39	39	39	39	29	0.1
Product development	26	31	38	54	57	−4	1.8
Production and mill/plant operations	33	38	45	55	71	4	17.0
Engineering/maintenance	31	35	40	49	60	2	10.3
Sales and marketing	30	38	49	58	75	2	10.5
Technical service/quality control	29	33	39	46	54	8	14.2
Other	27	33	40	58	72	−2	8.5

packages. Table 2 shows a breakdown of benefit values reported by respondents over certain ranges. However, the value of certain benefits such as company cars, life and medical insurance, and retirement plans is often hard to estimate, and this data may not be totally reliable. Therefore, Table 3, which lists tangible benefits usually received as part of compensation packages compared with the percentage of respondents who normally receive them, is probably more useful for comparison purposes.

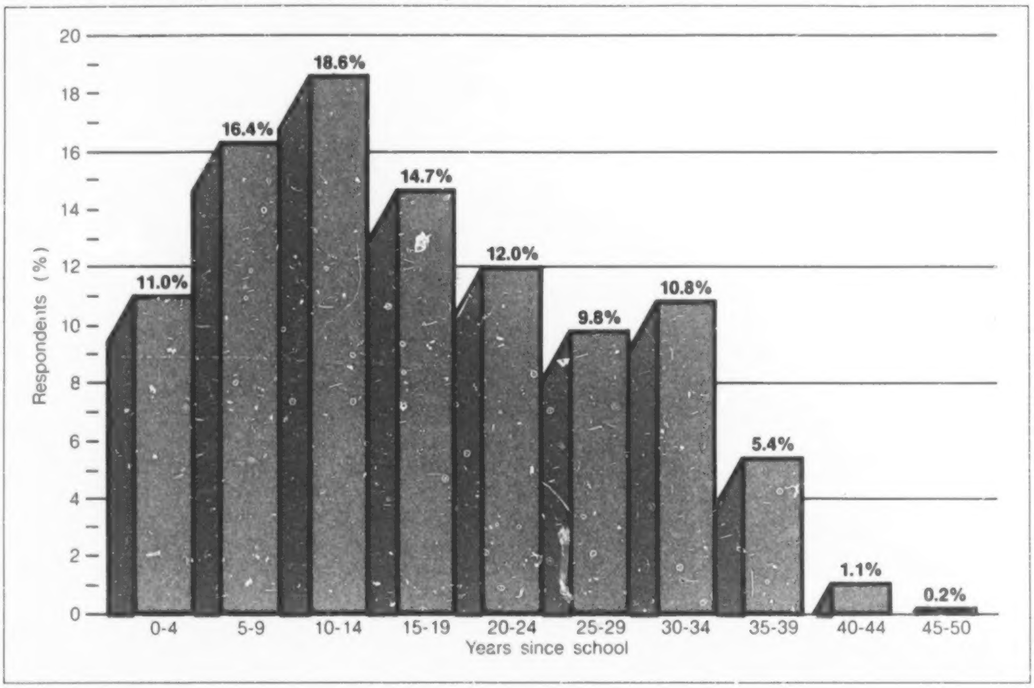
TABLE 6: **Income and size of employing organization, all respondents.**

	Income ($1,000)						
Organization's annual sales ($ million)	Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Change in median '83/'84 (%)	Respondents (%)
<100	25	32	44	56	72	−2	14.3
100 to 499	32	38	46	55	67	12	16.7
500 to 999	30	36	45	60	78	4	12.0
1,000 to 2,000	31	37	46	58	71	12	16.7
>2,000	31	36	44	56	70	2	33.9
Do not know	27	33	38	49	55	2	6.4

TABLE 7: **Income and level of supervisory responsibility, all respondents.**

	Income ($1,000)						
Supervisory responsibility	Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Change in median '83/'84 (%)	Respondents (%)
None	27	30	36	44	50	9	12.0
Indirect or staff	29	33	39	47	56	5	23.0
Team or unit	30	35	42	50	56	7	14.9
Project or section	32	36	46	54	60	7	18.9
Major department or division management	35	46	54	68	83	7	25.5
Corporate management of organization	38	51	70	104	150	9	5.6

FIGURE 2: **Years of experience distribution of respondents.**



ANALYZING THE DATA. The profile of our average 1984 survey respondent is very similar to that of last year's survey. The 7% increase in median salary this year seems to indicate that most respondents have benefitted from the industry's recovery to profitability. However, as previously mentioned (and also as found last year), respondents reported an average of only two salary increases in the past three years, while also indicating that their salaries are normally reviewed on an annual basis. This data certainly confirms last year's findings that salary freezes were in effect for many respondents during the recession and may still be in effect for some. Comments from respondents confirm this fact, and many people noted that their benefits have also been cut or frozen recently. These comments will be discussed more thoroughly below.

For the second year in a row, the highest median income ($70,000) was reported by respondents—as would be expected—at the corporate management supervisory level. In fact, Table 7 shows that the median income of all respondents corresponds directly to their level of supervisory responsibility.

A comparison (Table 5) of principal work function with median salary shows that the highest median salary ($58,000) belongs to those respondents in administration. Salaries of respondents in consulting ($50,000) and sales and marketing ($49,000) were a distant second and third.

No clear trend can be seen in Table 6, which relates size of the employing organization with median income, except that those respondents who do not know the amount of their companies' annual sales have a consid-

TABLE 8: **Income and professional experience, U.S. respondents.**

Years since school	Median income ($1,000)
0 to 4	32
5 to 9	36
10 to 14	43
15 to 19	49
20 to 24	49
25 to 29	55
30 to 34	52
35 to 39	57
40 to 44	50
>44	57

TABLE 9: **Income and educational field—bachelor's degree only, all respondents.**

	Income ($1,000)						
Discipline	Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Change in median '83/'84 (%)	Respondents (%)
Forestry/agriculture	30	39	49	65	83	22	3.5
Chemistry	33	38	48	55	68	20	9.8
Mechanical engineering	32	35	44	58	68	2	16.7
Chemical engineering	31	36	46	58	73	6	14.4
Civil engineering	34	36	45	55	64	12	4.2
Electrical engineering	32	37	48	54	63	11	5.4
Industrial engineering	29	37	44	56	82	7	2.3
Mathematics/physics	33	37	46	55	75	15	1.5
Computer science	25	25	25	25	25	−40	0.1
Biology/life science	27	29	33	42	53	2	2.0
Paper science and technology	29	33	41	51	65	7	13.1
Environmental science	29	35	38	46	51	−9	1.0
Business	31	37	49	59	78	13	18.1
Liberal arts	29	37	50	63	72	2	2.8
Other	30	34	44	56	80	−2	5.1

TABLE 10: **Income, professional experience and educational level, all respondents.**

Years since school	Highest degree	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Change in median '85/'84 (%)
0 to 4	B.S.	30	31	33	35	41	6
	M.S.	20	36	42	42	42	13
	Ph.D.	38	38	38	38	45	18
5 to 9	B.S.	29	33	37	40	43	2
	M.S.	41	43	49	57	60	16
	Ph.D.	29	33	40	49	56	−17
10 to 14	B.S.	34	36	44	50	58	4
	M.S.	42	47	50	61	64	0
	Ph.D.	32	37	42	54	64	2
15 to 19	B.S.	38	42	50	61	80	8
	M.S.	46	50	58	70	77	11
	Ph.D.	34	43	52	59	63	0
20 to 24	B.S.	41	44	57	75	92	16
	M.S.	39	49	52	71	101	−5
	Ph.D.	35	47	49	58	61	−6
25 to 29	B.S.	49	53	56	80	107	−3
	M.S.	25	51	59	70	70	13
	Ph.D.	38	40	78	92	160	36
30 to 34	B.S.	36	48	51	55	71	6
	M.S.	44	49	60	86	98	11
	Ph.D.	40	48	56	84	99	16
35 to 39	B.S.	48	54	68	72	77	21
	M.S.	66	66	66	66	66	32
	Ph.D.	43	43	59	89	90	100
40 to 44	B.S.	50	50	50	64	64	0
	M.S.	0	0	0	0	0	0
	Ph.D.	0	0	0	0	0	0
>44	B.S.	0	0	0	0	0	−100
	M.S.	0	0	0	0	0	0
	Ph.D.	0	0	0	0	0	0

erably lower median income than those who do know.

Self-employed consultants—although representing only 0.4% of all respondents—are doing quite well with a median income of $60,000 (Table 4). The second-best paying type of employment is consulting firms, whose respondents reported a median income of $51,000.

Table 8 shows that median income of all respondents increases with years of professional experience through 29 years. After that point the correlation is not as clear and seems to confirm the often-discussed problem of salary compression; i.e., salaries of recent graduates and newer employees advance faster than those of older, more experienced employees. Many of our respondents have commented on this problem. Interestingly, Canadian respondents with more than 29 years' experience also seem to encounter this problem (Table 19).

Table 9 contains a couple of surprises. The highest median income ($50,000) was reported by respondents with bachelor's degrees in liberal arts. And the discipline with the second highest income ($49,000) was forestry/agriculture, which tied with business. These two groups represent only 2.8% and 3.5%, respectively, of all respondents, and therefore this data may be misleading. It is hard to draw any conclusions without more definitive data, except to say that the pulp and paper industry presents excellent job opportunities for a very diverse group of people.

As with last year's survey, no noticeable difference in income and benefits was seen between geographic regions within the U.S.

TABLE 11: **Income, professional experience and educational field, bachelor's degree only, all respondents.**

Years since school	Income ($1,000) Forestry/ agriculture	Chemistry	Mechanical engineering	Chemical engineering	Civil engineering
0 to 4	31	36	32	32	31
5 to 9	34	38	35	38	37
10 to 14	39	37	42	46	44
15 to 19	41	[illegible]	52	49	48
20 to 24	54	48	57	52	50
25 to 29	42	58	60	62	53
30 to 34	65	50	52	55	49
35 to 39	47	50	66	57	60
40 to 44	0	31	52	70	0
>44	0	0	57	0	0

FIGURE 3: **Age distribution of respondents.**

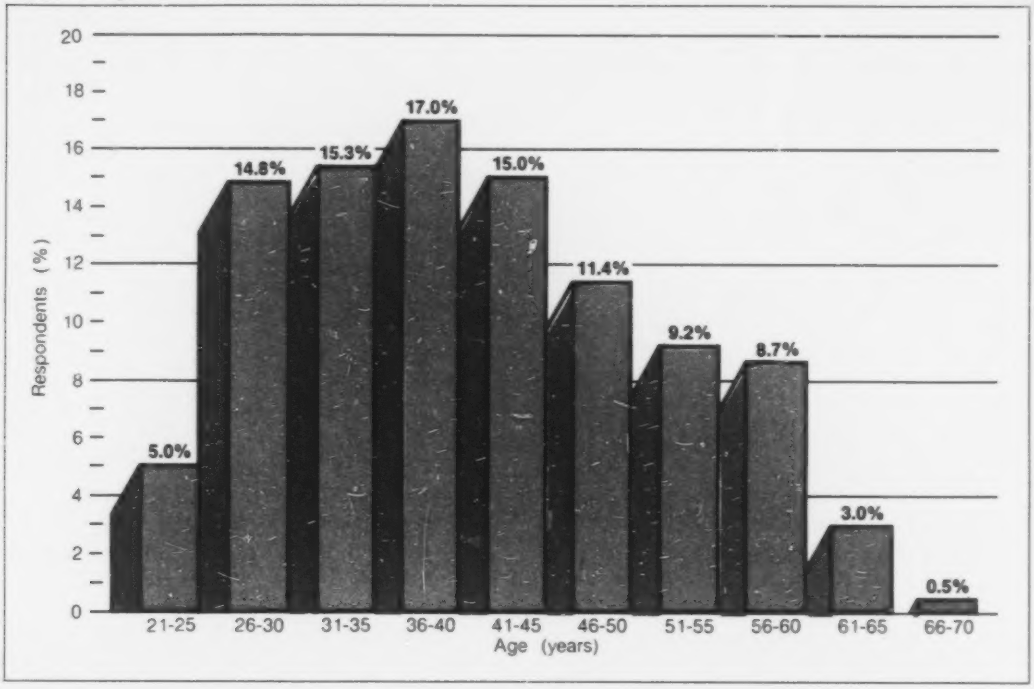


TABLE 12: **Income and number of years with current employer, all respondents.**

Years	Median income ($1,000)	Change in median '83/'84 (%)	Respondents (%)
5 or less	36	5	13.8
6 to 10	37	8	11.7
11 to 15	36	5	18.9
16 to 20	38	2	14.9
21 to 25	40	0	16.7
26 to 30	41	5	12.7
31 or more	41	0	11.3

TABLE 13: **Income and number of full-time employers to date, all respondents.**

Employers	Median income ($1,000)	Change in median '83/'84 (%)	Respondents (%)
1	40	8	33.6
2	44	4	27.6
3	47	11	18.2
4	49	6	11.1
5	50	2	6.2
6 or more	49	16	3.3

Job stability (or perseverence/experience) does pay, according to survey respondents with 26 or more years with their current employer (Table 12), who reported the highest median income ($41,000) in a comparison of income and years with present employer.

Conversely, job-hopping also seems to pay for those respondents who have had five or more employers in their careers (Table 13). Those respondents reported a median income of $50,000, compared with an income of $40,000 for respondents who have had only one employer. As previously discussed, our respondents are a very stable group, and only 38.8% have had more than two employers.

RESPONDENTS COMMENT. The survey form included a space for comments, and many interesting ones were received. Two themes predominated: pay and benefits of salaried personnel are not keeping pace with those of union workers at many locations, and salary compression is a problem that affects even mid-level professionals.

A B.S.Ch.E. working in technical service/quality control at a linerboard mill in the Northwest says, "Management of this corporation has failed to keep salaried personnel on an even par with union personnel. This is the primary reason for bad morale."

TABLE 14: **Income and type of wood/pulp/paper company, all respondents.**

Type	Median income ($1,000)	Change in median '83/'84 (%)
Wood products	42	2
Pulp/paper/paperboard	42	7
Woodlands operations	45	45
Chemical byproducts	40	−4
Corporate or administration	51	5
R & D	45	9

A B.S. in Chemistry working in environmental control at a midwestern market pulp mill echoed this sentiment: "Salaried personnel do not get the same benefits as the hourly people. We have gotten 7% and 8% raises when the union got 10% and 12%."

An engineering department section manager at a fine paper mill in the Northeast commented, "Virtually every hourly maintenance man working an equivalent number of hours will earn more—with much less responsibility—than I do. This is very wrong. We just

TABLE 15: **Income and number of years management experience, all respondents.**

Years	Median income ($1,000)	Change in median '83/'84 (%)	Respondents (%)
None	35	9	12.5
1 to 5 years	37	0	11.7
6 to 10	40	0	14.0
11 to 15	44	15	13.0
16 to 20	42	0	16.0
21 to 25	43	−4	[illegible]
26 to 30	45	−2	10.0
31 & more	42	−4	12.4

TABLE 16: **Income and number of employees managed, all respondents.**

Employees	Median income ($1,000)	Change in median '83/'84 (%)	Respondents (%)
None	39	8	24.1
1 to 5	41	2	24.1
6 to 20	42	4	20.0
21 to 50	46	12	16.5
More than 50	46	9	15.6

completed a six-week shutdown working 11 hours per day, six days per week, plus five full weekends in a row except one Sunday off. Hourly people get hurrayed and get paid. We got five days comp time."

Summing it up, a B.S. in pulp and paper science/technology at a southern market pulp mill says, "Professional salaries have fallen behind union hourly salaries in the last three to five years and show no signs of catching up. This is demoralizing, especially for young professionals who see people washing up the mill making more money than they are."

Respondents had some equally emotional comments on the salary compression dilemma. A B.S.M.E. at a paper mill in the Southeast notes, "It's difficult to cope with the fact that all new college graduates coming to work here start out at more than people who have been with the company for a while."

A B.S. in pulp and paper science/technology at a southeastern linerboard mill commented, "I was grateful for the large amount of my most recent salary increase until a new engineer was hired shortly after at almost the same salary. This is not the first time this has happened."

A technical service/quality control engineer at a fine paper mill in the Northeast asks, "Are managers aware of the effects of salary compression resulting from trying to obtain the most talented college graduates? They make more than some engineers with three to five years' experience."

The comments of a business major/administration manager at a midwestern mill summarized the problems faced by many industry professionals in recent years: "The uniform procedures for dealing with employee compensation seem to be anything but uniform. Blue collar formulas, wage freezes, salary increase limits, and union labor negotiations have created an extremely discriminatory and morale-deflating environment. I am thankful for having survived the recent recession and several less severe ones. However, I am also somewhat bitter over having earned $32,000 less than I would have if I had been granted the same increases union employees and salaried employees covered by the blue collar formula received in recent years. This grossly influenced my savings plan and will have a similar negative effect on my retirement benefits."

Of course, many favorable comments on the industry and its working conditions were also received—after all, 88.6% of the respondents did say they liked their jobs. These can be summed up by a B.S.Ch.E. at a midwestern research and development facility who says, "The people of the pulp and paper industry as a whole are hard working and great to work with. I love my job." Or, more simply said by a manager at a paper mill in the Northeast, "I love the pulp and paper industry."

One last amusing comment on compensation was sent by a maintenance manager at at fine paper mill in the Northeast: "I guess most people feel they are worth more than they get paid. I am not an exception."

The editors of *Pulp & Paper* hope that this annual survey will be useful to our readers. We have tried to design the survey to meet the needs and interests of all industry professionals. Reader comments on how this survey or *Pulp & Paper* itself can be improved are always appreciated and should be addressed to:

Executive Editor,
Pulp & Paper
2700 Cumberland Parkway N.W., Suite 530
Atlanta, Ga. 30339 ■

TABLE 17: **Salary distribution of Canadian respondents.**

	1984 salary ($1,000)
Lower decile	27
Lower quartile	32
Median	37
Upper quartile	50
Upper decile	60

TABLE 18: **Canadian employee benefits.**

Benefits value ($1,000)	1984 respondents (%)
0 to 1	6.1
1 to 2	13.3
2 to 3	8.2
3 to 4	15.3
4 to 5	5.1
5 to 10	28.6
10 to 15	12.2
15 to 20	5.1
20 to 50	6.1
>50	0.0

TABLE 19: **Income and professional experience, Canadian respondents.**

Years since school	Median income ($1,000)
0 to 4	25
5 to 9	33
10 to 14	36
15 to 19	40
20 to 24	45
25 to 29	48
30 to 34	43
35 to 39	50
40 to 44	29
>44	53

NOTE

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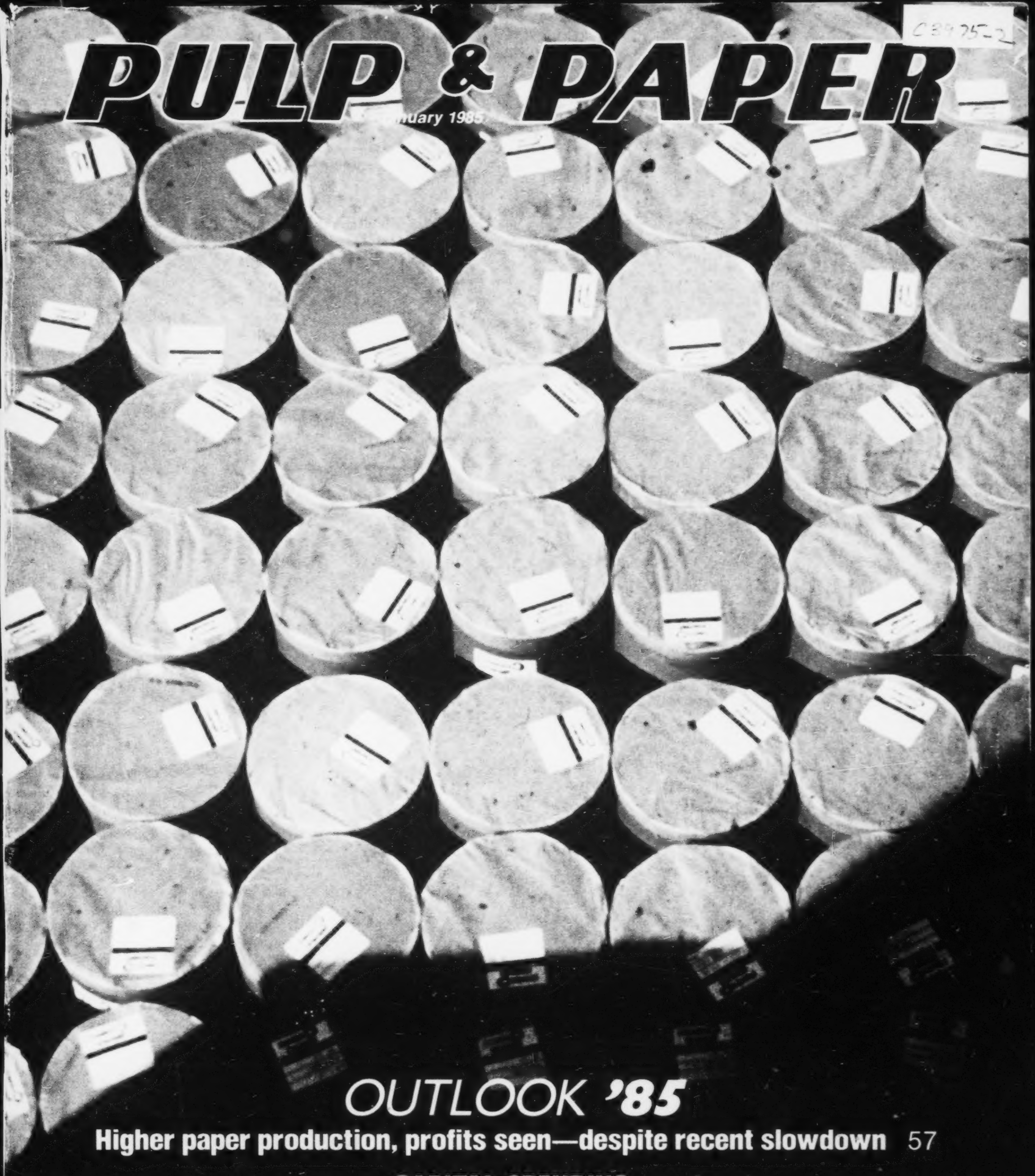

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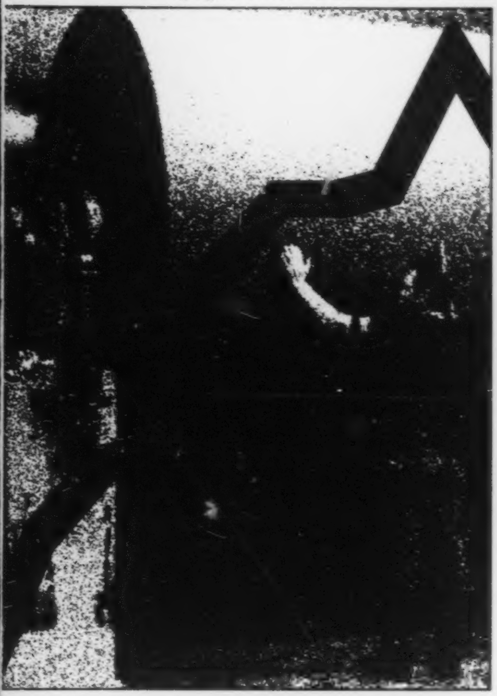

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The North American pulp and paper industry should see higher production and profits in 1985 if the economy stays on course and inventory correction is maintained. (Photo courtesy of Crown Zellerbach Corp.)

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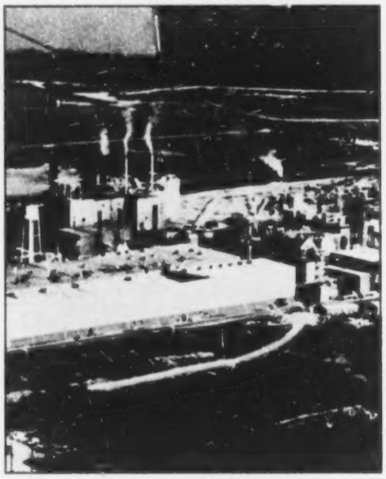

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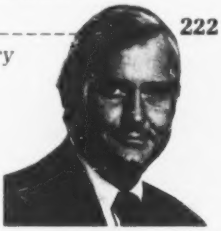

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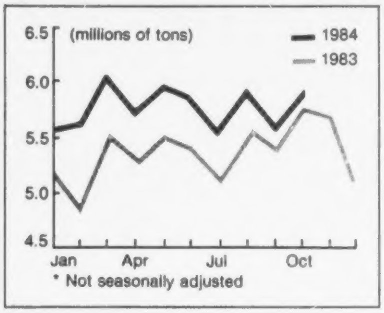
MONTH IN STATISTICS

U.S. paper and board production, 1984/83



October production of U.S. paper and paperboard reached 5.9 million tons, an increase of 1.5% over October 1983 which brings the year-to-date production total to 69.7 million tons, a 7.0% increase over the same period a year ago. If production remains at November levels (based on weekly data) during December, the 1984 total would be about 69 million tons, with paper just over 34.5 million tons and paperboard a little short of that level, according to American Paper Institute. These totals indicate a 5% gain for paper and a 6.5% jump for paperboard over their respective 1983 record highs.

Among major grades, coated paper leads ten-month totals with a 10.5% increase over the same period in 1983, although its pace slackened during October to a 3.8% margin over October 1983 levels. Bleached paperboard was the only major grade to dip below last October's production totals.

Canadian newsprint shipments in October hit 792,000 metric tons, a 3.7% increase over October 1983, according to the Canadian Pulp & Paper Assn. October newsprint mill operating rates were 93%. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Oct.	474	5.8	5,585	8.2
Uncoated groundwood (s)	Oct.	140	1.4	1,587	4.8
Coated paper (s)	Oct.	547	3.8	6,228	10.5
Uncoated free sheet (s)	Oct.	800	4.3	9,239	5.8
Other printing/writing	Oct.	123	−4.7	1,471	2.1
Total packaging and other paper (s)	Oct.	480	−5.3	5,844	3.8
Tissue	Oct.	425	1.2	4,880	1.9
Total paper	**Oct.**	**2,988**	**1.7**	**34,844**	**6.0**
Unbleached kraft paperboard	Oct.	1,457	1.2	17,480	8.1
Semichemical medium	Oct.	440	4.0	5,231	11.0
Bleached paperboard	Oct.	346	−0.6	4,113	4.5
Recycled paperboard	Oct.	683	0.7	8,043	8.4
Total paperboard	**Oct.**	**2,926**	**1.3**	**34,868**	**8.0**
Total U.S. paper and paperboard output	**Oct.**	**5,914**	**1.5**	**69,711**	**7.0**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Sept.	4,551	3.0	55,907	7.2
Market pulp production	Sept.	547	2.6	6,782	5.5
Wastepaper consumption at paper/board mills	Sept.	1,283	8.0	15,863	10.5
Pulpwood consumption (cords)	Sept.	7,246	0.6	87,991	3.3
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft^2)	Oct.	24.852	5.5	226.524†	5.5
Containerboard inventories at U.S. box plants and mills	Oct. 1	2,702	15.5		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Sept.	970	30.9	11,151	28.2
Imports of Canadian newsprint	Sept.	647	20.5	7,699†	15.3
U.S. paper exports (including products)	Sept.	399	3.1	4,555	−1.2
Exports of unbleached kraft linerboard	Oct.	149	−5.4	2,107	−9.5
Exports of woodpulp	Sept.	285	−15.4	3,632	1.1
Norscan producer chemical paper market pulp stocks	Oct.	1,494	−0.6		
Average Norscan market pulp mill operating rate	Oct.	101%	86.6%	93%	87.7%
CANADIAN STATISTICS [4] *(reported in metric tons)*					
Total newsprint shipments	Oct.	792	3.7	7,483†	7.7
Operating rates	Oct.	93%	88%	92%	84%
Inventories held by U.S. consumers	Oct.	1,013	1,001		
Other paper/board shipments	Oct.	451	0.9	4,363	8.7
Woodpulp shipments (export only)	Oct.	272	1.9	2,673†	8.8
Operating rates	Oct.	97%	88%	86%	85%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

LINERBOARD:
Limited growth should keep operating rates high

Grade structure:
Unbleached linerboard is made in a wide range of basis weights. Standard weight in the U.S. is 42 lb/1,000 ft², but other important weights are 26 lb, 33 lb, 69 lb, and 90 lb/1,000ft². Major use is in domestic corrugated container production, although about 13% of output is exported. About 300,000 tons of recycled "test" liner is produced in the U.S. but is excluded from these figures.

Production/capacity:
Unbleached kraft linerboard production rose strongly for a second consecutive year, reaching a new high of 15.96 million tons in 1984, up 6.4% from its 1983 level. Through the first nine months output was up 9.0%, but for the fourth quarter output is expected to be slightly below levels of a year ago as mills take downtime to reduce inventory levels.

Corrugated box shipments rose about 6.8% in 1984 to set a new record of 269.7 billion ft². This reflected a similar rise in real GNP and a 10% jump in U.S. industrial production. Linerboard output for export, however, should be down about 8%, to 2.1 million tons, reflecting the strong U.S. dollar. Inventories of containerboard at box plants and mills rose sharply during the summer months, but then began to drop and were down to 1.5 million tons by Nov. 1.

Outlook:
Corrugated box shipments in 1985 are expected to rise about 2.5% as the U.S. economy slows. Real GNP this year is expected to increase about 3% and industrial production to rise 2.8%.

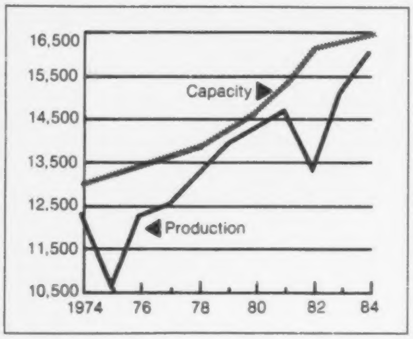
Linerboard production for domestic use is expected to rise only about 1.7% because of an estimated 100,000 tpy reduction in containerboard inventories. Production for export in 1985 is forecast to rise 6% to 2.1 million tons despite the continuing strength of the dollar through the first half of the year.

This situation should result in about 2.2% growth in total linerboard demand in 1985. With capacity expected to increase by only 1.4%, linerboard operating rates should rise slightly to 97.6% in 1985 from about 96.8% in 1984. Because of recent low profitability, liner capacity is expected to rise at only a 1.1% annual rate over the entire 1985-87 period with only one new machine announced (which replaces a machine to be converted to another grade).

Pricing:
Producers were able to implement two $30/ton price increases in 1984, in February and September, bringing the price of 42-lb to $350 in the eastern U.S. If the economy strengthens this spring, producers will probably try for another increase. (Historical year-end prices for 42-lb liner delivered east of the Rockies are as follows: 1984, $350; 1983, $290; $1982, $250; 1981, $270; 1980, $270; 1979, $270; 1978, $220. For earlier years see *Pulp & Paper PriceBook*.)

A $35/metric-ton fourth-quarter price increase for northern Europe to $440 c.i.f. has been delayed by U.S. mills until Jan. 1. ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1983	1984	1985e
Production	15,001	15,960	16,315
Capacity	16,217	16,488	16,723
Utilization rate	92.5%	96.8%	97.6%
Imports[1]	48	70	50
Exports[2]	2,281	2,100	2,247
Apparent U.S. consumption	12,768	13,930	14,118
Lb/capita	109.0	118.2	118.5
GNP ratio	8.32	8.47	8.42

1. Commerce Dept.
2. American Paper Institute (production for export).
e = *P&P* estimate.

TOP U.S. PRODUCERS *(000 tpy)*

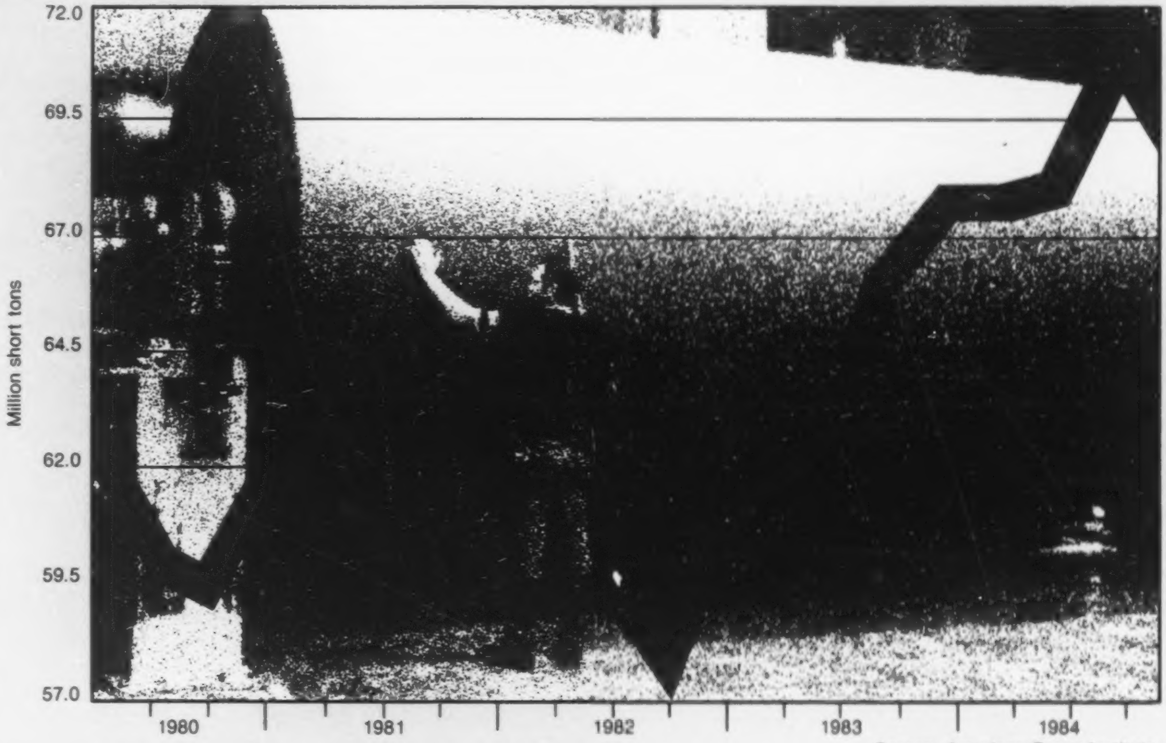
	Annual capacity	Market share (%)
1. International Paper	1,580	9.4
2. Weyerhaeuser	1,370	8.2
3. Stone Container	1,345	8.0
4. Union Camp	1,340	8.0
5. Champion International	1,037	6.2
6. Container Corp. of America	873	5.2
7. Owens-Illinois	720	4.3
8. Great Northern Nekoosa	710	4.3
9. Georgia-Pacific	700	4.2
10. Westvaco	660	3.9

Market share of top five companies:
16.7%

Market share of top ten companies:
39.9%

Total U.S. capacity (1985):
61.8 million short tons

OUTLOOK '85



U.S. PAPER AND PAPERBOARD PRODUCTION 1980-84

Source: American Paper Institute.

U.S. PAPER INDUSTRY RECOVERY EXPECTED TO CONTINUE IN 1985

Moderate production growth should keep operating rates at high levels and permit some increase in industry profits, but uncertainties persist

SPECIAL P&P REPORT

■ Despite some recent weakening, the U.S. economic recovery should continue at a slower pace in 1985. This will result in moderately higher production and profits for the paper industry, according to the forecasts of most industry observers.

Signs of a slowdown in the economy began to appear in the third quarter of 1984. Real GNP growth plunged to a 1.9% rate compared with a 7.1% rate in the second quarter. Industrial production leveled out and consumer spending weakened. Housing starts in October were a third below the high reached in February. And perhaps most disturbing, the trade deficit widened from a $120-billion annual rate in the second quarter to an almost $150 billion in the third, almost twice its size a year ago.

Paper industry production remained strong through the third quarter but started to weaken in the fourth quarter as some mills began to take downtime, particularly in the paperboard side of the industry. Price weakness also began to develop in uncoated free sheet and market pulp, although the discounting was more a reflection of excess capacity and the strong dollar than weakness in demand.

Clarence W. Brown of Shearson Lehman/American Express noted a "significant slackening in virtually all

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Outlook '85 was prepared by Pulp & Paper news staff editors Will Mies, Dave Allan, and Debra Adams.

areas of estimated industry growth, reflecting the maturation of our nation's economic recovery, coupled with persistently high interest rates, federal budget deficits, and a strong U.S. dollar."

RECESSION UNLIKELY. Nevertheless, most analysts surveyed by *Pulp & Paper* do not expect the paper industry to slide into a full-blown recession. Their optimism stems from recent actions by the Federal Reserve to reduce interest rates, plus the likelihood that financially flush consumers will step up spending soon. "Consumers can only save and hold back on borrowing so long before they get restless," noted Norma Pace, senior vice president of the American Paper Institute.

Slower economic growth and the Fed's credit loosening moves caused interest rates, as measured by the prime rate, to drop to 11.25% in early December from around 13% last summer. The decline in rates should spur such interest-sensitive segments of the economy as housing and automobiles. Another positive development has been the gradual weakening of the dollar from its peak reached last fall. "This will reduce the drag of the trade deficit on the economy," commented Bruce Kirk of Goldman Sachs.

SPRING PICKUP. Most analysts expect the economy to pick up in early spring after the current inventory correction has been completed. Pace expects real GNP growth in 1985 to increase 3.1% and industrial production to rise 4%. This is fairly close to the consensus of Wall Street security analysts surveyed by *Pulp & Paper*, who look for a 3.3% rise in real GNP this year after last year's roughly 6.5% jump.

Pace said she expects interest rates as measured by the prime to decline a bit further this year to around 10% to 10.5%. And rates should remain fairly stable "because there won't be that kind of credit demand pressure." Some forecasts, however, are less optimistic. Morgan Stanley, for example, expects interest rates to rise later in the year as the economy picks up strength and the Federal Reserve again pulls in the credit reins, according to analyst Thomas P. Clephane.

U.S. paper industry production should rise around 3% in 1985, with paper showing a smaller gain than paperboard, according to Pace. The consensus of analysts is that total paper industry production will rise 2.8% in 1985 from last year's level of about 69 million tons. Production in 1984 was up about 5.9%, following a 9.5% jump in 1983 from the recession low in 1982.

U.S. exports of paper and paperboard may show a modest rise in 1985 after declining 2% in 1984 due to the strong U.S. dollar and slower economic growth in other countries. Pace expects linerboard exports, which declined about 4% to 5% in 1984, to increase moderately, aided by further weakening of the dollar.

Imports of paper and paperboard into the U.S. may level off or decline after jumping about 28% in 1984. "Uncoated free-sheet paper imports appear to have reached the high-water mark and should begin to decline," according to H.C. Bowen Smith of Salomon Brothers. Such imports were running at a 500,000-tpy annual rate through the first nine months of 1984, nearly three times their comparable year-earlier level.

MIXED GRADE OUTLOOK. Operating rates for U.S. paper mills will rise to about 95.8% in 1985 from about

WHAT THE ANALYSTS ARE PROJECTING FOR 1985.

Percentage change from 1984 levels
(unless otherwise indicated)

	Growth in real GNP	Paper/board production	Operating rates[1]		Prices	Costs per unit output	Operating profits		Housing starts[2]
			Paper	Paperboard			Paper	Forest prod.	
Mark S. Rogers Dean Witter	+3.6%	+3.2%	97.2%	98.6%	+12.5%	+4.6%	+49%	+64%	1.7 mill.
William Wigder First Manhattan	+2.8	+3.2	97	98	+4.0	+2.0	+15	+100	1.65
Bruce Kirk Goldman Sachs	+3.5	+3 to +3.5	95	96	+6.5	+4 to +4.5	+15	+30	1.8
Evadne S. Lynn Merrill Lynch	+3.2	+1.2	95.3	95.9	+6.2	+5.2	+31	+32	1.65
T. Clephane/J. Carroll Morgan Stanley	+2.9	+1.6	94.4	95.1	+5.2	+3.7	+14	+7	1.65
Lawrence Ross Paine Webber	+3.3	+3.5	97	95	+6 to +7	+3 to +4	+25 to +35	+25 to +35	1.7
H.C. Bowen Smith Salomon Brothers	+4.0	+3 to +5	95.5	96.5	+3 to +7	+3 to +4	+25 to +30	−10	1.75
Clarence W. Brown Shearson Lehman	+3.0	+2.5	95	95	+4.0	+4.0	+10	+20	1.6
George Adler Smith Barney	+3.3	+3.0	95.4	96.5	+8.0	+4.0	+15	+18	1.7
Average	**+3.3**	**+2.8**	**95.8**	**96.3**	**+6.4**	**+3.9**	**+23.2**	**+32.3**	**1.7**

1. Production as percent of capacity.
2. Millions of units.

94.7% last year, while rates for paperboard mills increase to 96.3% from 95%, according to the consensus of analysts. The improvement in operating rates reflects both the moderate growth in production and the slow rate of industry capacity growth. The latest American Paper Institute survey shows capacity for paper rising 1.2% and paperboard rising 1.4% in 1985.

Prospects for individual grade segments will vary significantly, however, mainly depending on the rate of capacity expansion taking place. Clephane estimates operating rates in 1985 will be 97.5% for coated paper, 98% for newsprint, 99.2% for unbleached kraft paper, and 96.5% for linerboard.

But he sees uncoated free sheet averaging only 89.6%, reflecting substantial capacity being added in this grade. The high operating rate for unbleached kraft paper, despite declining demand, reflects a number of machines being shifted to other grades. Evadna Lynn of Merrill Lynch also sees relatively high operating rates in 1985 for semichemical medium at 97.5%, bleached board at 96%, and tissue at 94.9%.

HOLDING BACK PRICES. Even though the paper industry will be operating near full capacity in 1985, "prices are not likely to accelerate as rapidly as in previous periods of comparably tight operating rates," according to Lynn. Among the reasons she cited are: the strength of the dollar, which is encouraging low-priced imports and hurting export demand; the low-inflation economic environment and lack of cost-push pressure; and the effect of accelerating incremental expansion as industry cash flow rises.

On average, analysts look for about a 6.4% advance in paper and board prices in 1985, following about an 11% increase in 1984. Market pulp prices, which have slid about 10% since last summer, are also causing some uncertainty. "Price weakness in pulp is infectious and will spread quickly to other paper products," noted Smith.

Nevertheless, George Adler of Smith Barney, Harris Upham remains fairly optimistic about most industry segments. "We expect linerboard prices and box prices to firm again next spring and feel that coated grades also will improve by another notch. Even the more depressed uncoated business paper and pulp markets may firm by the second half of this year, and the same may be true of market pulp." An apparent change in strategy by Procter & Gamble to emphasize profitability rather than market share gains may also help pricing in the tissue segment, he noted.

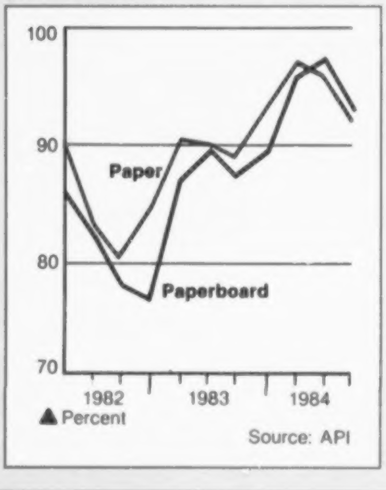
Costs per unit of output are expected to rise about 4% this year, up from about a 2% to 3% rate of increase in 1984. Most second-year increases for labor agreements negotiated last year in the East appear to have been around 5% to 6%, and improved productivity should keep the growth in unit labor costs down. Energy costs should also rise slowly, with some possible further weakening in oil prices and improvement in the paper industry's energy efficiency. Pulpwood prices in the South rose about 4% last year (with some regional variations) and will probably not rise much faster this year.

PROFITS TO RISE. With prices outpacing costs, and moderate production growth, U.S. paper company operating profits may rise by about 23% in 1985, according to the consensus view. Estimates range from about a 10% increase projected by Brown to a 49% increase seen by Mark Rogers of Dean Witter Reynolds.

The recent decline in interest rates has caused most forecasters to raise their projections for housing starts in 1985. Salomon Brothers, for example, has raised its estimate for 1985 housing starts from 1.5 to 1.6 million units to 1.70 to 1.75 million units, according to Smith. He says, "In 1985 the key factor in the performance of wood products operations will be the level of wood imports from Canada."

A flood of Canadian lumber imports, overcapacity in both lumber and plywood, and weak wood product exports depressed the U.S. wood products industry last

U.S. PAPER/BOARD OPERATING RATES ROSE . . .



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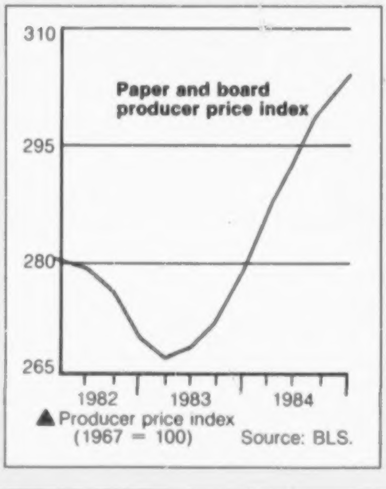
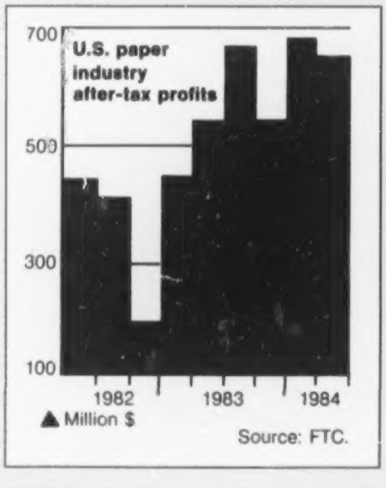
. . . WHILE PRICES FOR MOST GRADES CLIMBED IN 1984 . . .



Source: BLS.

. . . CAUSING PROFITS TO STAGE A PARTIAL RECOVERY



Source: FTC.

year. The consensus of the analysts is that the operating income for forest products companies will rise about 32% in 1985. The blurring distinction between paper and forest products companies, however, is causing some confusion in the results of the *P&P* survey, with some analysts basing their estimates on just the wood products divisions of forest products companies, and others basing their's on entire companies, which would include some contribution from paper divisions.

Lawrence Ross of Paine Webber Mitchell Hutchins, for example, estimates that income for paper/forest products companies will be up 25% to 35% this year, but that profits from their wood products divisions will be flat, following a 20% to 40% decline last year.

More optimistic is William Wigder of First Boston, who believes enactment of a timber relief bill last year "will have a far-reaching positive effect on the lumber and plywood industry." The legislation will reduce an enormous potential liability that would have retarded profits for at least five years until the timber was cut. It will also result in the closure of obsolete capacity and may keep stumpage prices in the Pacific Northwest from falling further. He expects profits from wood products operations to jump more than 100% this year.

LONG-RUN OUTLOOK. Prospects for the paper industry in 1986 are more unclear, with some forecasts predicting a recession and others a period of slow growth. Most analysts with paper industry forecasts for next year expect growth in the 2% range, which is enough to keep operating rates in the high 96% to 97% range, given the continued slow rate of capacity growth.

One factor that could influence the long-run rate of industry capacity expansion is the tax plan proposed by the Treasury Dept. "Our initial view of the proposed tax legislation is that it would take away a substantial amount of the economic incentive for building a greenfield plant that has been provided by accelerated depreciation and the investment tax credit," Clephane noted. This could slow the rate of capacity growth and "tilt the balance toward acquiring existing facilities rather than going into major new projects. The end of timber capital gains is also going to increase the uncertainty on the part of many companies in holding timber properties."

Pace, however, pointed out that the tax changes in accelerated depreciation could give a very short-term boost to capital spending. If projects already being built are "grandfathered" (allowed to use present liberal depreciation schedules rather than the new, more restrictive rules), many companies may try to rush ahead on projects to qualify under the old rules.

Communication & Information Services (CIS), a Walnut Creek, Calif.-based firm, projects U.S. paper and paperboard consumption will grow at a 2.2% annual rate during the 1986-95 period, compared with a 3.9% rate during the 1976-85 period, and a 2.4% annual rate for the 1970-84 period.

Demand for paper grades will be substantially lower than in the last decade due to poor growth for kraft paper and slower growth for tissue grades, according to CIS. Demand for printing and business papers will continue to be high, increasing at a 3.5% annual rate through 1995. Paperboard demand will also remain healthy over the next decade, increasing at a 2.1% annual rate. "The outlook for market pulp in the U.S., however, is not encouraging," the CIS report said. "Domestic demand for paper-grade market pulp will increase by less than 1% annually."

COATED PAPER

Another great year ahead

At this time last year, it looked like coated paper mills would operate full-out through 1984. Looking ahead to 1985, it appears that prediction will hold true for the new year as well. In fact, it now seems that the only thing that could depress coated paper before the next round of capacity gets fully up to speed in 1987-88 is a recession.

In September, a Morgan Stanley & Co. research report on Consolidated Papers Inc. forecast that the U.S. coated paper industry would run at 101% in 1985 after racking up a virtually identical performance in 1984. Paper industry executives feel that prediction is still good.

Some worry that the economy could slow down in late 1985, but many feel that even a modest slowdown this year wouldn't drop coated paper operating rates below the mid-90s. Furthermore, the recovery in Europe is leading overseas suppliers to scale back their plans for shipments to the U.S., albeit modestly. No growth in coated paper imports this year—from 1984's already record level—is likely.

A further note about imports of both coated groundwood and coated free sheet: big though the volumes of such grades have been in the last year, they have not undermined U.S. pricing because paper continues to be very tight. Indeed, they tend to be priced 15% or more above domestic quotes, whereas in soft markets like uncoated free sheet the domestic mills have to fight off seriously discounted imports.

What that means for the mills is a return to historic profit levels as prices continue to rise faster than the consumer price index. It is not clear how far prices will jump this year. Some observers worry that (in the words of one observer) mills are in danger of "killing the goose that lays the golden eggs" by raising prices so fast that it hurts the competitiveness of print advertising media.

While there is disagreement about the continued viability of the print media in an environment of rising paper prices, there is no question about the volume of demand for paper. American Paper Institute figures show total coated paper output running at a better than 6.2-million-short-ton rate in 1984, which implies an operating rate of more than 97%. Operating rate figures are, in fact, subject to differing definitions, but it is accurate to say that coated groundwood and coated free-sheet mills in the U.S. ran full-out in 1984.

Imports of coated paper totaled more than 400,000 tons in 1984. The rate actually rose as the year went on, reaching a new high in July. By comparison, imports in 1983 totaled just 162,000 tons. The large majority of both years' figures—probably better than 90%—was coated groundwood.

Little added capacity is expected in coated groundwood or coated free sheet in 1985. There was some unexpected "sponge" effect on 1984 capacity, raising capacity by 320,000 tons over what the American Paper Institute had originally expected it to be for the year. This effect occurs when mills find ways to increase capacity through modifications in production, optimized grade mix, etc. But even the sponge effect did not bring on enough new coated paper capacity to satisfy customers' needs.

COATED GROUNDWOOD. Coated groundwood shipments totaled more than 3.6 million tons in 1984. U.S. coated groundwood capacity is expected by the American Paper Institute to grow by just 43,000 tons in 1985, leaving room for virtually no year-over-year increases in production.

Anyone who looks solely at year-over-year figures in 1985 would be inclined to think that coated groundwood mills were having an off year. Coated groundwood shipments are expected to rise just 4% in 1985, perhaps a third of the growth rate of each of the last two years.

But consumers have essentially nowhere else to go for paper, given that imports are not expected to rise and supercalendered uncoated groundwood (SC) paper supplies are as constrained as coated. Some consumers will necessarily use lower grades of uncoated groundwood, or will shift to uncoated free-sheet offset or the sometimes-more-available heavier weight coated groundwood. But they will always shift back to the preferred grade if they can.

This means customers should have little ability to resist price increases. But there was comment among executives and other observers in late 1984 that two price increases in 1985 might hurt the competitiveness of magazines, inserts, and flyers.

Consolidated Papers Inc. may have been responding to these fears when it announced a January 1985 price increase of 5%, compared with previous predictions that prices would go up 6% to 8%. During the same week, St. Regis Corp. announced its new price list, raising quotes by 6%. Morgan Stanley & Co. analyst, Jeanne Carroll, projected an average increase of 8.8% in coated paper prices in 1985 and 7% in 1986. One papermaker had earlier predicted a 14% price rise for the year, in two stages—something that raised the ire of magazine publishers when it was mentioned. Paper industry executives argue, on the other hand, that they need higher prices to justify the necessary capacity expansions to continue serving a growing market.

Even the prospect of two 5% to 6% hikes in the year made publishers fume, although they admit they have no place else to go if the paper industry decides to raise prices again in 1985. But one U.S. mill executive pointed out that some large printers are likely to continue buying some imported paper, even when U.S. capacity rises in 1986-88, simply to keep their options open. And with 900,000 metric tons of new European lightweight coated capacity coming onstream between now and 1988, they may be able to exercise considerable leverage with U.S. suppliers by continuing to buy overseas.

In the meantime, publishers have only the most minimal inventories. Due to seasonally low consumption, they were able to begin building stocks slightly at the end of 1984. Some also put paper into inventory earlier in the fall when the considerable import volumes of the summer came in. Much of that imported paper reportedly arrived late and thus ended up in inventory rather than going onto the printing press.

But publishers continued to pay for truck deliveries from the mill, indicating their stocks are minimal at best. And seasonal trends in the early months of 1985 will make further inventory accumulation impossible before the summer.

Consumers won't get any respite from new capacity in 1985 or 1986. The only significant new capacity definitely scheduled to come online before the end of 1986 are a new 190,000-short-tpy machine being built by Repap (parent of Midtec Paper Corp.) in New Brunswick (scheduled startup in the first quarter of 1986), and a 200,000-tpy unit being started up by Bowater Inc. in South Carolina in the second half of 1986. However, the two machines together won't produce much more than 100,000 tons of paper in 1986, and they won't be operating at capacity until 1988 or 1989.

Kruger Inc. is expected to start up a new coater at Trois Rivieres, Que., some time in 1986, adding 77,000 short tpy of capacity. But the market probably won't see much more than half of that added production in 1986.

Finally, Repap's Nitec Paper Corp. mill in Niagara Falls, N.Y., may be restarted in 1985, adding 80,000 tpy of capacity. But nobody is yet counting on the likeli-

GROWTH TRENDS IN U.S. CAPACITY.

	Additions 1975-1984		Additions 1985-1987	
Grades	**Ten year increase**	**Average annual growth (%)**	**Three year increase**	**Average annual growth (%)**
Total paper & paperboard	13,222	2.0	3,568	1.6
Total paper	8,319	2.6	2,283	2.0
Newsprint	2,125	1.7	(55)	(0.3)
Printing/writing	5,642	3.4	2,183	3.6
Packaging & industrial converters	(369)	(0.6)	(222)	(1.3)
Tissue	921	2.0	377	2.3
Total paperboard	4,903	1.5	1,285	1.2
Unbleached kraft	3,825	2.5	572	1.1
Solid bleached	266	0.7	252	2.0
Semichemical	789	2.2	174	1.1
Recycled	22	—	287	1.1
Total wood pulp	10,002	1.9	2,460	1.4
Dissolving & special alpha	(320)	(1.9)	—	—
Sulfite	(675)	(3.2)	(2)	—
Sulfate & soda*	8,678	2.3	2,186	1.7
Semichemical	336	0.8	85	0.6
Mechanical	1,982	4.0	191	1.0

*Includes screenings. ( ) = loss.
Source: American Paper Institute.

hood, the timing, or the amount of that development.

All told, it is unlikely that North American capacity will rise by more than 300,000 tons between 1984 and the end of 1986. The likely growth in U.S. consumption should be more than that, while imports probably won't rise above present levels during that period. The outlook for coated groundwood through the end of 1986, barring a recession, is for a continued sold-out market.

COATED FREE SHEET. The outlook for coated free sheet isn't much different. This grade family is more seasonal than coated groundwood, allowing customers to occasionally build a little inventory. But mills operated full-out through 1984 and will do the same in 1986. Capacity will go up by 145,000 tons in 1985, but this will do little more than help the industry keep its existing customers satisfied.

Some publishers and printers may upgrade to free sheet because they can't get groundwood. But aside from recently started machines moving up the learning curve plus some improvements on existing machines—such as a 32,000-ton increase at Consolidated in late 1984 and early 1985, brought about by a rebuild of a coated free-sheet machine and a coated one-side machine—there isn't a lot of room for mills to accommodate new business.

Imports don't play the role in coated free sheet that they do in coated groundwood, although some high-quality European paper certainly has come in to the U.S. in the last couple of years. A few U.S. mills have even added "super-premium" No. 1 grades to meet competition from the best of the imports, but these products represent a small volume of business.

The general perception among observers of the industry is that advertisers continue to demand improved quality in the printed product, which will help coated free-sheet mills this year. Indeed, in 1984 coated free sheet grew faster than coated groundwood, with huge increases in shipments especially to free sheet's biggest market: commercial printers.

While inserts, flyers, premium magazines, and other coated free-sheet end uses are expected to continue growing considerably faster than the U.S. economy, mill executives worry that these markets may be maturing, eventually bringing growth rates down to the level of some other sectors.

In the short term, most papermakers are more worried about how to get the maximum possible production out of their machines. And they are trying to figure out how far they can expect prices to go up this year.

Mills raised prices about 5% in November and December after originally announcing the hikes for Oct. 1. The postponement was not caused by a soft market. In fact, with the annual report season in full swing, the fall and winter are the busy season for coated free sheet. Rather, the delay seems to have been caused by lack of support for an increase by one or two major mills.

With markets expected to remain tight through 1985, it seems likely prices will rise faster than the consumer price index. But it is not yet clear how soon mills will try for a 1985 increase.

UNCOATED FREE SHEET

Spotty performance continues

Cold water got thrown in the face of over-enthusiastic uncoated free-sheet producers in 1984. Once reality set in, many began to realize they could be in for a long period of mediocre news.

Late last year many would have been happy to hear even mediocre news. Prices rose so fast in 1983 that many observers believe the industry got carried away and tried to hike its quotes one too many times.

When a price increase that had been planned for July 1984 had to be canceled, pricing began to fall apart. By the end of 1984, transaction prices were down near the levels of the summer of 1983. Prices hadn't yet fallen as low as the recession depths reached in mid-1982, and it seemed unlikely that would happen. But some observers did feel quotes would drop a little more early this year before leveling out.

Unfortunately for North American uncoated free-sheet mills, there may not be any improvement before the end of the year, or beyond. Overcapacity and a flood of imports have crippled domestic pricing, and no industry executives will confidently predict when either situation will correct itself.

One New York security analyst spoke with senior executives at three U.S. companies within the space of a week in December 1984. Asking each executive when the market might turn up, he got three different answers: by the end of 1985, by the end of 1986, and "we don't know." The analyst himself tended to agree with the third assessment.

COMPUTER PRINTERS. Things may turn out better than anybody expects. For example, uncoated free-sheet shipments in 1983 rose about 11%, while copy paper shipments were up a whopping 18%. With cut-size paper high on every big uncoated free-sheet manufacturer's priority list, copy paper is obviously a key to the health of the industry.

Unfortunately, copy paper rose only about a third as fast in 1984 as in 1983. But a takeoff in small, inexpensive computer printers could clearly give the paper industry enough of a boost to absorb much of the new capacity being started up in the next few years.

However, the burst in computer printers that may rescue paper mills just isn't going to happen this year. Total uncoated free-sheet shipments in 1984 jumped a healthy 5.8% (the annual rate through October). But with capacity having jumped 7.8% in 1984, that only translates into an operating rate of about 91.5%. Most observers believe the 1985 operating rate will be no higher due to a 4.7% rise in capacity this year. It seems unlikely that consumption will rise more than 3% to 4% in 1985, although shipments could go up a bit faster as imports drift slightly lower.

The reason net imports may finish this year slightly below 1984's unprecedented 440,000-ton level is that U.S. prices have gotten so low—under pressure from cut-rate imports—that there doesn't seem to be much room for further declines. So some executives speculate that with European demand rising and the dollar falling (they hope), and with customers preferring to avoid imports—due to unreliable shipping schedules and the difficulty of getting quality problems straightened out—consumers may drop their plans to buy from abroad.

Also on the positive side, tight conditions in coated publication and advertising grades may lead some insert and flyer printers—and even magazine publishers—to use uncoated free sheet from time to time. Uncoated free-sheet roll offset was available at bargain-basement prices in late 1984: typically $600/ton or a little less for 50-lb paper, with occasional spot deals available as low as $540. Customers may decide that with coated paper unavailable at any price, cheap uncoated free sheet is a deal. This is not expected to move huge volumes to uncoated paper, however.

But it should be remembered that commercial printers are no strangers to uncoated free sheet. in fact, they use more uncoated free-sheet paper than any other kind. In 1983, about 48% of the paper shipped to printers was uncoated free sheet, while coated paper represented about 47%. But coated paper shipments to printers have been growing about half as fast as uncoated free sheet—something that may change a little with coated paper in continued shortages.

"SPONGE" CAPACITY. Another thing that may make conditions look a little better than they now appear is connected to the appearance of a sizable "sponge" effect in 1984. As markets tightened up in 1983 and early 1984, mills found ways to stretch manufacturing capabilities. This, coupled with an optimized grade mix, enabled the industry to increase its 1984 capacity by 529,000 short tons more than the American Paper Institute had expected at the end of 1983. Now that markets are soft once again, one industry executive estimates that perhaps 200,000 tons of that improvement may disappear.

But that is a drop in the bucket compared with the capacity additions that are now being worked into the system or planned for the next five years. The American Paper Institute estimates that 1987 capacity, including only expansions that had actually been announced in late 1984, could be 1.2 million tons higher than in 1984. This does not include more than 200,000 tons of net new capacity being added between now and 1989 by Domtar Inc. in Canada, or a possible new Boise Cascade Corp. machine added by the end of the decade.

This year, the industry is trying to absorb capacity from a machine started up in 1983 at Champion International Corp.'s Courtland, Ala., mill, and machines that came onstream in 1984 at Crown Zellerbach Corp.'s Camas, Wash., facility, and Union Camp Corp.'s Eastover, S.C., mill. Also, International Paper Co. has said it will convert between 300,000 and 350,000 tpy of capacity to uncoated free sheet in 1985. In the next two or three years this capacity may be absorbed, but 1985 looks like a year of loose markets to most executives.

Furthermore, western Europe is adding 900,000 short tpy of capacity between now and 1988, leading one U.S. executive to warn that the "globalization" of the printing/writing industry means U.S. prices may be "combative" for some time. If prices stay put, he added, marginal producers may "fall by the wayside." With major producers trying to buttress prices, the smaller mills giving deep discounts may be digging their own graves. *(P&P and Gorham International will sponsor The First International Symposium on the Business Papers Market, May 1-2, at the Waldorf-Astoria, N.Y. Contact: P&P, 370 Lexington Ave., N.Y., N.Y., 10017; 212-683-9294.)*

CONTAINERBOARD

Market should be fairly tight

Limited new capacity additions make the outlook for containerboard bright in 1985, even if demand shows only modest growth, according to most industry executives and analysts.

The market for linerboard and corrugating medium began to show some softness in the second half of 1984 due to high mill production levels, slowing box cut-up rates, and weak export shipments. The most visible sign of softness was in the rise of rollstock inventories at box plants and mills from around 1.4 million tons during the first four months of the year to a peak of 2.77 million tons (7.1 weeks of supply) on Aug. 1.

INVENTORY DROP. After some difficulty, mills succeeded in pushing through a $30/ton increase that brought the eastern price of 42-lb linerboard to $350/short ton and the price of 26-lb semichemical medium to $340 in September. Some discounting persisted, however, particularly on medium, even though box producers were generally successful in pushing through about a 7% to 8% increase on corrugated box prices.

Mills have begun to bring production into better line with demand, and inventories had dropped to 2.604 million tons (6.1 weeks of supply) by Nov. 1, according to Fibre Box Assn. statistics. Inventories were expected to remain relatively stable or decline slightly through the weak final months of 1984 due to extended mill downtime announced by a number of major producers.

WEAK EXPORT SHIPMENTS. Part of the weakness in the domestic linerboard market reflected lower export shipments due to the strong U.S. dollar. The rise of the dollar over the past couple of years dramatically improved the competitive position of Scandinavian kraft liner and Continental test liner producers in Europe. Increasing supplies of board from such nontraditional producers as Brazil have also been keeping prices competitive in the European market. A move to boost U.S. liner prices in Europe by $35/metric ton last fall was unsuccessful; another attempt will probably be made soon.

Prices in Far Eastern markets have also been weak due to the strong dollar, high inventories, and increasing broker activity. The lower net on export shipments has caused mills to ship a greater amount of tonnage to the domestic market.

For all of 1984, box shipments rose close to 7%, to around 270 billion ft^2, while linerboard production increased about 6.4% to nearly 16 million tons. Linerboard exports were expected to be down about 5% to 2.1 million short tons, based on Dept. of Commerce data. Semichemical medium production in 1984 totaled about 5.1 million tons, up about 8% from the previous year.

FUTURE OUTLOOK. Morgan Stanley analyst, Thomas P. Clephane, told *Pulp & Paper's* First International Unbleached Kraft Conference in New York City, Nov. 12-13, that he expected box shipments to rise only about 2% in 1985 based on real annual GNP growth of 2.8% and a 2.5% rise in industrial production. This assumes a rebound in economic growth early this year followed by one or two quarters of flat to slightly lower economic activity in the second half as interest rates rise and the Federal Reserve tries to rein in the economy.

He predicted U.S. linerboard production would rise about 1.2% in 1985, assuming about a 150,000-ton inventory drawdown and about a 5% rise in U.S. linerboard exports. With linerboard capacity expected to rise 1.4%, he predicted that operating rates would drop from 96.7% in 1984 to 96.5%—"a historically very tight level."

While Morgan Stanley's economic growth forecast for 1985 is below that of most other Wall Street firms, its forecast for 1986 is somewhat more optimistic. Clephane looks for a return to moderate economic growth next year, which would lift box shipments by about 2%. Together with a 7% rise in export shipments, this would result in a 1986 linerboard operating rate of 98.2%.

A somewhat different scenario was presented by Clark S. Johnson, executive vice president and chief operating officer of Virginia Fibre Corp., based on a forecast by Copeland Economics. He said that Copeland is projecting a 3.3% rise in box shipments in 1985, followed by a 3.5% decline in 1986 as the U.S. economy begins a major economic slowdown. Operating rates for semichemical medium are forecast to rise from 99.8% in 1984 to 101% in 1985 before dropping slightly in 1986.

SLOW CAPACITY GROWTH. Limited capacity additions are a major reason for the high operating rates in both linerboard and semichemical medium. Capacity for both unbleached kraft and semichemical board is expected to rise at only a 1.1% rate over the 1985-87 period, according to the latest American Paper Institute capacity survey. Only one new kraft linerboard machine at Chesapeake Corp.'s West Point, Va., mill is scheduled to come online, and it will replace a machine that will probably be converted to another grade. No new semichemical medium machines have been announced, although Owens-Illinois Inc. is studying a new machine which will replace some existing capacity.

Recycled containerboard could show somewhat more rapid growth with Temple-Inland scheduled to start up its 175,000-tpy recycled linerboard mill in Los Angeles, Calif., and International Paper Co. possibly reactivating a 130,000-tpy mill in Riegelsville, Pa.

Additional capacity could come from incremental expansion projects involving installation of new high-loading presses. Packaging Corp. of America is believed to be studying such a project, which would involve the addition of 100,000 tpy of incremental capacity. Some tonnage could also come from the shifting of kraft paper machines to linerboard production. All of these factors should keep containerboard operating rates relatively high—but prevent any real shortage of supply.

BOXBOARD

Holding its own into '85

Boxboard mills will experience relatively high operating rates through 1985 due to only slight capacity additions and continued good demand throughout the year, market observers indicate. Pricing should improve throughout the year, with transaction levels reaching—and possibly exceeding—1981 posted levels, which the industry has tried to reestablish for the past three years.

Late in 1984, most 20-pt clay-coated boxboard in rolls was being sold at about $400/short ton, although some was as high as $445. Chipboard prices improved somewhat, reaching about $300/ton early in the year in many areas and as much as $360 in the West. Those levels were maintained well into the fourth quarter despite a drop-off in orders due to a decline in construction activity. Much of the strength in chipboard markets was attributed to substantial demand for gypsum linerboard.

The recycled board market was firmest on the West Coast, with chipboard in that region stronger than clay-coated in backlogs as well as pricing. Recycled board price increases posted in the West in March/April were generally accepted.

Solid bleached sulfate (SBS) prices improved somewhat during the year. One marketing executive estimated they rose 10% from the previous year, while another said the hike was as much as 13%. SBS 15 pt in rolls was being sold for about $600/ton to most customers, while others were paying as much as $665. Price increases posted throughout the year were partially implemented, succeeding mostly in reducing discounts rather than raising actual transaction levels.

Converted carton prices remained depressed on large orders and national accounts mainly due to too much converting capacity and the ability of midwestern converters to buy, convert, and ship cartons to the West Coast at lower prices, said one marketing executive.

PRICE HIKE EFFORTS. Despite lackluster markets, producers continued to attempt to raise prices late in the year (a normally slow season for containerboard) in an attempt to meet rising costs, especially for secondary fiber. Wastepaper prices shot up, more than doubling in some cases, during the first half of the year. They declined gradually in the last six months, providing some relief for recycled board producers.

With only one new 175,000-short-tpy bleached board machine coming onstream in 1985, SBS operating rates should reach the high 90% range in 1985, some observers estimate. Clay-coated recycled board running times will remain in the low 90s, though, because of existing overcapacity. Uncoated recycled markets could be the firmest of all because capacity in this sector has actually declined in recent years.

Paper industry analyst Thomas Clephane of Morgan Stanley & Co. expects bleached board mills will run at 98.91% of capacity in 1985, while recycled board mills will operate at 92.09%. These compare with a projected overall industry operating rate of 96.37% in 1985.

Industry backlogs were dropping and customers' inventories were high late in 1984, but many industry observers were optimistic that business would pick up again in 1985. Some observers attributed the decline to an adjustment in the market caused by too much optimism earlier in the year, which caused inventory buildup. One marketing executive felt the market's balance would be restored by the end of the first quarter of 1985.

Many observers feel clay-coated board will continue to take a bigger share of the folding carton market from SBS in 1985, though at a slower rate than in recent years. The biggest concern, however, is competition from solid unbleached sulfate paperboard (SUS).

As SUS markets have declined in recent years—particularly in the beverage carrier business—SUS demand has risen in the folding carton sector. Observers feel this trend will continue in 1985, particularly in such end uses as detergent boxes and other products where wet strength is a bigger factor than appearance.

WASTEPAPER

Downturn to level out

Paper stock performance over the next 12 months will lack much excitement, according to many market observers. The deterioration in prices fueled by rising inventories, and a drop in orders through the second half of 1984 will continue during the early part of 1985. No later than the start of the second quarter, the market should level off, reaching a new balance, they believe.

U.S. wastepaper exports are expected to play a key role in the market's performance in 1985. even exceeding 1984's projected record rate of over 3 million tons. The previous high was set in 1980, when 2.66 million tons were shipped, according to the Dept. of Commerce.

Interest rates and the strength of the U.S. dollar will also be important elements in determining how the market will operate in 1985, observers say. One northeastern broker said the strong dollar contributed heavily to the surge in exported wastepaper by lowering the price of imported finished goods. Another said it had a depressing effect, keeping U.S. wastepaper prices high compared with rates in other parts of the world.

Freight charges were also influenced by an inflated dollar, causing shippers to reduce rates on freighters returning from the U.S. to busy exporting countries such as Taiwan, South Korea, and Japan. This not only brought U.S. wastepaper costs more into line with those in such areas as Europe, but also created competition within the U.S., with some freight rates to the Far East from the East Coast close to West Coast charges.

OVERSEAS INFLUENCE. During the summer, as the domestic market weakened, the two coasts competed for overseas business. Foreign buyers, aware that the market was deteriorating, took advantage by undercutting prices. Domestic price competition followed.

By year-end, prices were being slashed heavily for some grades. Hardest hit were the high grades because these prices had risen the most earlier in the year when panic buying caused supplies to dip dangerously low and mills to bid against one another for orders.

A two-month lockout in the British Columbia pulp and paper industry in the first quarter, combined with strengthening business activity during the first half of 1984 in such key areas as autos and construction, fueled the scramble for orders that lent a false buoyancy to the market, some market observers said. This began to taper off in the second half as higher grades stabilized, while oversupplies in some lower grades began to surface.

Pulp price deterioration later in the year had a severe impact on pulp substitutes and high-grade deinking prices during the fourth quarter. Prices in the lower grades had begun to deteriorate in the third quarter in an effort to slow down the supply stream. Collection of such grades as old corrugated containers (OCC) and old news had reached saturation due to prices being pumped up earlier in an effort to meet rising demand.

SECOND-HALF PICKUP. During the second half of the year, while the economy was weakening, several strikes in the West accelerated the decline in the secondary fiber market in that region, causing an oversupply in some grades, particularly OCC. This glut is expected to continue through the first quarter of 1985, begin to turn around in the spring, and possibly lead to strong demand—even shortages—in the third and fourth quarters, according to one west coast executive.

The startup of Inland Container's 175,000-tpy Ontario, Calif., recycled linerboard mill in late 1985 will absorb 18,000 tons/month from that region's paper stock supplies, he noted. This will lessen overseas influence in that area and possibly cause Far East consumers to shop in other regions, further tightening those markets.

In addition to a relatively flat market forecast for the wastepaper sector in 1985, fewer structural changes should be experienced than in 1984. The year was marked by many mills changing hands, going bankrupt, or integrating with converting operations.

In its most recent capacity survey released in November 1984, the American Paper Institute projected wastepaper demand as a percentage of total fiber furnish will increase to 24.2% in 1987 from 23.2% in 1984.

The changes in 1984 have led many market observers to expect wastepaper demand to rise in the next few years, with the role of the independent dealer and small mill operator being diminished further by corporate integration into the market. ■

CANADIAN INDUSTRY

MORE SILVER LININGS THAN CLOUDS AHEAD FOR CANADA'S TROUBLED MILLS

■ Canada's pulp and paper industry seems to be approaching peak operating conditions in every respect except pricing, and even there most observers expect some improvement in 1985. Operating rates will average between the mid-90s and 100%. Prices should generally rise somewhat faster than North American inflation rates.

Canadian mills won't get much of a boost from the performance of their own economy, and not much more from the U.S. economy. A survey of economic forecasters performed by the Conference Board of Canada in late 1984 calls for a 2.6% rise in Canada's gross national expenditure (GNE) in 1985, down from 4.2% last year. The Conference Board itself is even more bearish, calling for GNE growth to fall from 4.1% in 1984 to 0.6% in 1985, with nearly flat performance rates expected in some provinces.

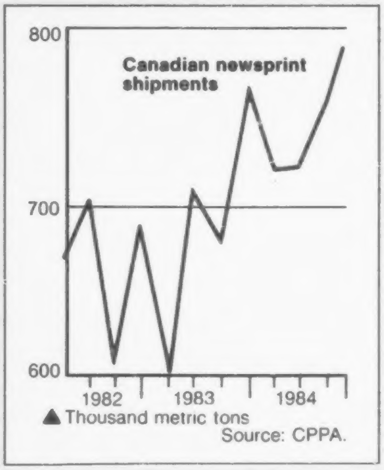
Disagreement is more widespread on the inflation front, with some economists expecting modest rises in prices. The Bank of Montreal forecasts a consumer price index (CPI) increase of 3.1% this year, after a 4.4% estimate for 1984. Others are much more bearish. The high-side estimate comes from McLeod Young Weir Ltd., which believes the CPI will rise 6.5% this year after going up 4.5% in 1984. The consensus estimates are for increases of 4.5% in 1984 and 4.8% in 1985.

While economic activity is moderating and inflation is heating up slightly, maturation of the recovery will bring average pretax corporate profits back to a more sustainable 10.5%, according to the consensus, after 1984's increase of 24.5%. At the same time, Canadian industries will be investing more in plants and equipment. Growth in that area will go from 1.9% in real terms in 1984 to 4.4% in 1985. Financing will be more expensive, however, with the finance companies' 90-day rate going from 11.65% in 1984 to 12.21% in 1985.

In the consumer sector of the economy, Canadian housing starts should total 148,000 in 1985, according to the consensus, compared with 141,000 last year. Personal consumption will rise by 2.5%, after last year's 3.6% increase. Consumption will benefit marginally from a very slight drop in unemployment from 11.2% to 11.0% in 1984, according to the consensus. The Conference Board itself actually expects to see unemployment rise to 11.5%, while Richardson Greenshields feels it will moderate to just 10.1%.

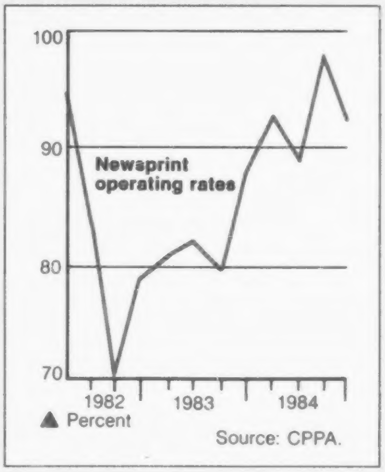
One of the most important indicators of the health of the Canadian pulp and paper industry is the level of the Canadian dollar since the Canadian profit picture has a discounted dollar built into it. The consensus calls for a Canadian dollar averaging US$0.7693, virtually unchanged from 1984. Each economist places a different value on the 1984 dollar, but none sees more than a three-cent change in 1985. McLeod Young Weir believes

CANADIAN NEWSPRINT SHIPMENTS ROSE . . .



Source: CPPA.

. . . AND OPERATING RATES CLIMBED FROM DEPTHS . . .



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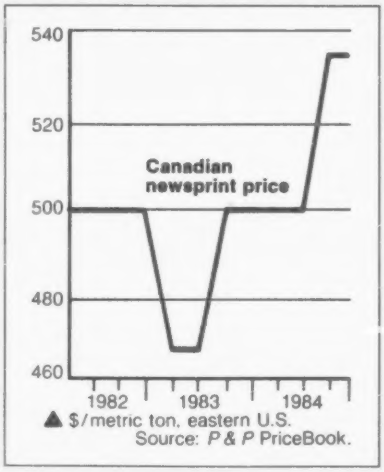
. . . WHILE PRICES STRUGGLED TO REBOUND



Source: *P & P* PriceBook.

(Outlook continues on page 71.)

the Canadian dollar will rise from US$0.75 to US$0.78 (both are year-end figures rather than the annual averages in McLeod's case).

Economic performance will vary widely by province. The Conference Board believes real gross domestic product will be up 0.8% this year after a 3.9% rise in 1984, with Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Prince Edward Island, and Saskatchewan performing above par and Newfoundland, Ontario, and Quebec showing little economic improvement. Only Saskatchewan will show even slightly robust growth, with a 3.8% rise forecast. Unemployment will range from the 8.0% of Saskatchewan to the 21.1% of Newfoundland.

With that kind of unimpressive domestic performance, Canada's pulp and paper mills will have to rely on the U.S. economy for any kick it's going to get. The Conference Board's consensus calls for the U.S. economy to grow at a 3% rate in 1985, down from 7% in 1984. But fortunately for Canadian industry, most mills were enjoying healthy operating rates at the start of 1985 and should be able to maintain or even improve them throughout the year—even with slow economic growth.

Newsprint mills should run at 93% this year, with eastern mills operating two or three points higher than that. British Columbia producers are running 10% or more behind. Uncoated groundwood mills will operate virtually full-out—95% or better, in all likelihood. Canadian chemical paper-grade market pulp mills, however, may not run much better than their 88% to 89% average rate for 1984 (which included the nine-week British Columbia strike).

Price improvement will be the rule, with healthy increases likely in some uncoated groundwood grades and a gradual improvement in newsprint. Yet newsprint will still fall short of long-term historical trend-line levels. Pulp prices will probably show further weakness in the first half of this year before firming.

NEWSPRINT

Recovering from weak markets

In any other year than 1984, newsprint producers would have been ecstatic at the way their business grew. U.S. consumption rose by about 7%, growing at a nearly double-digit pace well into the second half. And both U.S. and Canadian industries improved their operating rate performances dramatically from 1983's recession-depressed levels: the U.S. industry ran at a 3% higher operating rate than in 1983, and Canada operated more than 5% better than the previous year.

Unfortunately, continued world oversupply in newsprint and a recession hangover of price discounting made 1984 a year of clouds and silver linings. And 1985 won't start out much better.

Through the first half of 1985, discounts will continue to be common. The industry in the East will struggle to push through an Apr. 1 price increase, and opinion is divided on how long it will take before the hike sticks. The industry in the West may try for a second-half hike, but observers say there are still too many questions to make any prediction of 1985 price behavior look like a safe bet.

It seems clear that demand won't grow as fast this year as it did in 1984. The consensus has U.S. consumption growing from 11.3 to 11.4 million metric tons in 1984 to about 11.5 to 11.7 million metric tons this year. *Pulp & Paper* is forecasting a 3% growth in consumption in 1985, identical to what is seen by Bell Gouinlock Ltd. security analyst, Brian Topp, of Toronto, Ont. But a marketing executive with one major producer sees growth of just 2%, and analyst Jaak Puusepp of Pemberton, Houston, Willoughby, of Vancouver, B.C., calls for growth of just 0.5%.

Tim McManus, a senior vice president with Central National-Gottesman Inc., wrote in 1984's fourth quarter edition of his company's "Central National-Gottesman Report" that his forecast of a consumption rise of 2.5% to 3% this year is "inline with the majority of the estimates for growth in GNP."

Indeed, the health of the U.S. economy is the key to the performance of the newsprint industry this year since the industry will not be aided by most of the factors that helped it in 1984: inventory accumulation, a U.S. national election, the Olympics, and the normal buoyancy of an economic recovery period.

But 1984 created a strong base for future growth. What that means for the North American industry this year is a very good year in terms of operating rates, probably leading to an even better 1986. This will be a year of firming in prices, perhaps setting the stage for big increases in the next two years.

Producers will continue to complain through 1985 that their profits are a long way from where they should be on a historical trend-line basis. And publishers will continue to be effective at using imports and small North American producers to partially frustrate the pricing intentions of the old "club" of major North American manufacturers.

U.S. VS CANADIAN MILLS. In the last few years, large producers have often found themselves taking lower operating rates than the industry average in order to support industry pricing. Since U.S. capacity is more in the hands of small producers than is Canadian capacity—and since U.S. publishers would often rather buy domestic paper than import from Canada—the U.S. industry tends to run slightly better than its northern counterpart. The comparative operating rates for 1984 were about 93% for the U.S. and 91% for Canada. In 1985, those rates should rise to 96% and 93%.

Some North American producers in late 1984 were beginning to plan downtime in the coming months, reflecting or anticipating weak order books. Publishers were thought likely to reduce inventories around the end of 1984 or the start of 1985. But with a price hike looming in the East in April, it is possible stocks will be rebuilt in February and March, giving mills a temporary boost. Then, as the year progresses, normal economic growth—barring a recession—should soak up much of the excess capacity in North America.

But North Americans realize more and more that there is no such thing as a continental newsprint market: markets for commodities like newsprint are global. And the world oversupply situation—in which more than two-thirds of the estimated 3 million short tpy of overcapacity is located outside North America—is likely to continue undermining U.S. pricing in the form of low-priced imports for as long as the U.S. dollar remains overvalued.

NORTH AMERICAN EXPORTS. Concurrently, North American exports should begin to make something of a comeback in 1985, even in the face of a strong dollar. Economies in Europe, Asia, and to some extent Latin America are following the U.S. economy into a recovery. The consensus of observers is that this will provide modest relief for North American exporters. Puusepp projects a 6.2% increase in Canada's shipments offshore, while Bell Gouinlock's Topp actually sees those shipments rising by 10%.

On another optimistic note, Puusepp thinks that the European Economic Community's import quota for duty-free newsprint from outside Europe will be raised this year from 635,000 tons to 750,000 tons. This will help Canada to supply growing European needs if it can compete with Scandinavian suppliers on price.

Whether offshore shipments from Canada will return to 1983 levels or not remains to be seen. Offshore shipments in 1984 dipped by about 8% from the previous year, with major growth in shipments to Asia being more than offset by sharp drops in Europe and Latin America. Overcapacity in Europe, combined with the strong dollar and the ability of Scandinavian mills to continually underprice Canadian paper, is likely to continue hurting Canada through much of the year. In the October 1984 issue of *PaperTree Letter*, publisher Ross Hay-Roe noted that 900,000 metric tons of capacity is starting up in western Europe alone in 1984-85.

Unfortunately for North American mills, that means the oversupply situation on this continent will still take some time to disappear, as Canadian tonnage displaced from overseas markets is forced back into North America. The overcapacity situation is worse in the West than in the East due to overbuilding of capacity in the early 1980s. Pemberton's Puusepp thinks Canadian operating rates will average 92.3% in 1985, with mills in the East leading the pace at 94.6% while British Columbia producers lag far behind at 81.1%. At the same time, U.S. mills will run at 96.4% this year in Puusepp's scenario.

NORTH AMERICAN NEWSPRINT SUPPLY/DEMAND BALANCE (000 metric tons).

	1984e	1985e
U.S. consumption	11,330	11,670
Net inventory change	+232	−100
U.S. demand	11,562	11,570
Sources of U.S. supply		
U.S.	4,748	4,718
Canada	6,609	6,677
Europe	205	175
Canadian shipments		
To U.S.	6,609	6,677
To Canada	1,038	1,069
Overseas	1,292	1,421
Operating rate (%)		
U.S.	95	96
Canada	90	92

Source: Brian Topp, Bell Gouinlock Ltd. e = Estimate.

FLOOD OF IMPORTS. While the West continues to be flooded with excess domestic supply, most observers point to imports as a contributory factor. Puusepp feels total offshore imports to the entire U.S. will run at about 200,000 tpy for the next two years, compared with 1984's 220,000 tons. One major North American producer actually thinks imports will rise by more than 10%.

On the other hand, Crown Forest Industries' vice president of newsprint and pulp sales, Brian Cooper, told *Pulp & Paper International*'s recent Second International Publication Papers Conference in London that the western region of the U.S. has exceptional economic prospects, which should help western mills to survive the current troubles. "With California's high-tech industries and diversified economy, its total employment and income are both forecast to outperform the national averages over the next three years," Cooper noted.

Cooper also remarked that British Columbia is in an ideal position to exploit growth potential in Far Eastern markets. Quoting Stanford Research Institute, Cooper noted that "for the period to 1995, North American newsprint exporters need to look to Asia for trade expansion. Asian imports will grow by 4.5% annually."

But in the meantime, British Columbia mills—like their competitors in the East—will spend 1985 recovering from one of the biggest capacity expansion hangovers in paper industry history.

Little new capacity expansion is planned for North America in the next few years. Only one new mill is planned at this time: Great Lakes Forest Products Ltd.'s 154,000-metric-tpy Washington State project, with start-up set for early 1987.

In fact, no other projects are in the works that represent a significant net addition to capacity. In 1985, U.S. capacity is expected to drop by 1.5% from 1984, and Canadian capacity will drop by about 1%. This trend of flat or declining capacity is expected to continue through 1986.

DISCOUNTING WIDESPREAD. While capacity trends bode well for producers in the long run, they don't appear to be happening fast enough to help in the first half of 1985. In late 1984, publishers reported they were getting frequent phone calls from mills they normally do not do business with offering spot orders at substantial discounts.

One buying cooperative negotiated a five-year contract with Rothesay Newsprint, giving the co-op's members a reduction of 7% from Rothesay's list price over the life of the contract if they take approximately the

NORTH AMERICAN NEWSPRINT OPERATING RATES (%).

	1984	1985	1986
United States	96.0	96.4	96.4
Canada	92.4	92.3	97.0
Eastern Canada	96.0	94.6	98.9
Western Canada	75.1	81.1	87.3

Source: Jaak Puusepp, Pemberton, Houston, Willoughby Ltd.

contracted 1,000 tons a month. Larger discounts than that were given to several major publishers on many spot orders.

But the industry was expected to support the April price increase, at least to the extent of discounting from the new, $570/metric-ton level rather than from the present $535 level. Indeed, Topp thinks Abitibi-Price—which he believes is trying to become a price leader again—will try to raise prices again, to $600, in the fourth quarter of 1985. He is optimistic that Scandinavian shipments to the U.S. will drop slightly in 1985, helping to buoy U.S. prices.

Ross Hay-Roe wrote in October that a price increase is likely in the West as well as in the East this spring. Puusepp expects western prices to go up by $35 July 1. He also believes that "a healthier pricing environment" will develop in 1986 as operating rates improve to 98.9% in eastern Canada, 87.3% in British Columbia, and 96.4% in the U.S.

One major Canadian producer told customers, in a corporate newsletter, that some tightness could occur in 1986 as demand improves and some machines are upgraded to groundwood specialties. The newsletter also observed that increasingly serious shortages will appear in 1987 and 1988, barring the announcement of significant new capacity soon. Clearly the company feels any capacity expansion would have to be financed by higher prices.

But on the other side of the aisle, Scripps-Howard Supply Co. president, Homer E. Taylor, told *presstime* (the publication of American Newspaper Publishers Assn.) in November that the chances of an April price hike in the East depend on how the market looks early in the year, adding that "right now it appears to be very loose."

Furthermore, newspaper industry analyst John Morton, of Lynch, Jones & Ryan, wrote in a recent issue of his *Newspaper Newsletter* that "even that [April 1] appears optimistic, unless the dollar falls in value and a continuing surge in advertising volume keeps consumption growing at its presently healthy pace (neither case seems likely at the moment). Sooner or later, demand may very well catch up with supply. But until that time, the newsprint business will remain a frustrating one."

Even so, most observers believe the level of frustration in newsprint will be a lot lower in 1985 than it was in the previous two or three years—and the outlook for 1986 could be quite a bit better.

UNCOATED GROUNDWOOD

Making all the paper they can

Most uncoated groundwood paper mills in Canada and the U.S. couldn't have made much more paper in 1984 if their lives depended on it, and 1985 is bound to be a bit better. With the exception of some lingering softness in the low end of the quality spectrum, this sector of the industry is enjoying a papermaker's dream.

Gains were felt first in the top end of the quality and price spectrum, with advertisers and printers forced to accept uncoated paper because of shortages in coated paper supply. That led some magazines and insert and flyer printers to switch to supercalendered uncoated groundwood paper (SC), or even to premium rotonews. The benefits rolled down the scale until even bottom-range offset and rotonews were helped, although far less than their more elegant companions.

DOUBLING OF SC MARKET. SC, in particular, has become a major market in just a few years—more than doubling in size in the U.S. between 1980 and 1984 to today's estimated 865,000 short tpy. The future of the market is very much in flux, with a number of companies rumored to have been looking at getting into the business over the last year—but no actual announcements were made.

European producers who represent about 45% of North American supply—and who are most heavily concentrated in the premium area of the market represented by fully clay-filled sheets—are said to be telling customers they may not be able to keep up present levels of shipments through 1985 due to demands from home-market consumers.

Most observers expect two or three major expansions to take place within the next two to three years. Bell Gouinlock Ltd. analyst, Brian Topp, of Toronto, Ont., believes that likely shutdowns of old groundwood specialties machines will be offset by new SC installations and switches of newsprint machines to various groundwood specialties products.

In the meantime, demand for SC is expected by observers to exceed supply for as long as coated paper remains tight. Demand may get a boost this year from the Sunday supplements, which are expected to take a look at upgraded sheets in order to stem recent advertising lineage losses. (The Sunday magazines may also be getting a boost from a switch on the part of mega-advertiser Procter & Gamble to more use of print media, including Sunday supplements.) The supermarket tabloids may look at similar upgrades in paper quality.

There is some doubt that the Sunday publications and the tabloids will make the expensive jump all the way up to SC, but it is clear nonetheless that SC is becoming established enough to have gained some credibility as an attractive product in its own right, not just a cheap alternative to coated paper.

With mills that can make high-brightness, top-quality paper running virtually sold out through the year, North

American uncoated groundwood mills are expected, on average, to continue operating at 1984's 95% of capacity or better. Indeed, if year-to-year increases in shipments are modest, it will only be because most mills can't get a great deal more production out of existing machines.

Morgan Stanley Inc.'s Thomas Clephane estimates U.S. mills as a whole ran at 99% in 1984 and should average about 101% in 1985. Recovering from the recession of the previous years, mills were able to boost shipments by about 7% in the U.S. Some outstripped that, particularly in shipments to commercial printers, which were up by more than twice the average. Book and magazine publishers increased their purchases of uncoated groundwood by about the industry average or a bit less. Shipments to catalog and directory printers somewhat exceeded that level of increase.

CANADIAN CAPACITY JUMPS. The Canadian mills were running about 20% ahead of the previous year, partly because of the contribution of Abitibi-Price Inc.'s Beaupre, Que., mill, converted from newsprint, along with other miscellaneous upgrades and conversions—and of course the overall improvement in markets.

Canadian Pulp & Paper Assn. figures show a 5% jump in Canadian capacity in 1984 and another 11% increase in 1985. In the same period, U.S. capacity is expected to remain flat. So if either country's uncoated groundwood industry shows any significant year-over-year increase in shipments this year, it will be Canada's. The increase will reflect the industry's greater ability to meet unprecedented levels of demand. Actual consumption overall is expected to only slightly exceed the 3% growth rate foreseen in the U.S. economy.

A drop in imports from Europe is likely to offset any increase in Canadian capacity as overseas mills respond to pressure from their own markets. European producers are also leery of signing long-term contracts in a period when the dollar may have reached its peak.

Mills that are not able to compete in the top end market may find they are at a competitive disadvantage because some customers are losing interest in 60-brightness standard roto or offset sheets. And producers of groundwood forms will find their product under year-long price pressure from heavily discounted free-sheet forms bond. One producer, however, said he doesn't think groundwood mills will actually lose a big chunk of their market share even if pricing is hurt. Indeed, at the end of 1984, forms converters could get 80-brightness forms bond for less than $100/short ton more than 70-brightness groundwood paper.

PRICE INCREASE. In fact, the whole area of groundwood papers represented by the least expensive forms, rotonews, and offset papers could have some trouble winning sizable price increases in 1985. But products at the top end are expected to rise in price faster than the U.S. consumer price index, and in some cases, perhaps much faster.

SC prices were scheduled to go up 6% in January, approximately matching lightweight coated (LWC) price increases. Observers believe the chances for any further rise in SC quotes will depend on whether LWC mills are able to get through a second increase in 1985, and opinion is sharply divided on that question. But whatever happens with SC and LWC will probably help mills in their efforts to get higher prices for premium offset and roto sheets.

One market that is harder to call than the traditional publication papers for business papers is directory paper, where the breakup of American Telephone & Telegraph into "American Regional Bell Operating Companies" (ARBOCs)—each with its own directory operation and its own paper-buying system—has sown nothing but confusion. This change, plus an increase in the number of paper companies competing for phone directory business, has made for a more competitive market.

One factor that may help paper companies is the proliferation of ideas for novel telephone directories, such as those being discussed for specific professions, ethnic or language groups, and other subsets of the general population. Few of these innovative ideas have yet become a reality, one paper company executive noted, but when they do, "it will make things more interesting for us." In the meantime, he expects the directory paper market to grow at about 4% to 5% this year.

Some areas of the groundwood paper business, like inserts and flyers, have been "going like a scalded cat," in the words of one executive. He reflects consensus opinion when he says that even if there is a slowdown in the economy—which he doesn't expect before the second half of 1985 and probably not before the fourth quarter—it will be manifested in groundwood paper by reduced pressure on mills from paper-short customers, but not an actual drop in shipments. And if there is no U.S. economic slowdown, growth will continue all year long.

MARKET PULP

Oversupply causing price drop

The nine-week British Columbia labor dispute helped pulp prices recover dramatically during the first two quarters of 1984. The labor dispute caused an estimated production loss of more than 600,000 tons of chemical paper-grade pulp, resulting in a major shift in the supply and demand balance.

This was reflected in the price of northern bleached softwood kraft (NBSK), which jumped roughly $100/metric ton in two successive moves to $540/metric ton on Apr. 1 in both northern Europe and North America. But only a few months after the resumption of pulp shipments from the British Columbia mills, the market began to soften.

North American-Scandinavian producer inventories, which had reached a low of 907,000 metric tons during the strike in March, began to climb. By the end of October inventories stood at 1.49 million metric tons. Pulp consumers, which had built up large inventories during the strike, held off on purchases.

PRICES WEAKEN. Pulp prices began to weaken, and by November the price of NBSK had tumbled to about $480 to $490/metric ton in northern Europe. The strong dollar contributed to the drop earlier in the fall by improving the competitive position of Scandinavian and nontraditional pulp producers and increasing the price of pulp in European currencies.

High production levels at existing mills and the start up of new capacity in the second half of 1984 contributed to market weakness. Average Norscan market pulp operating rates in the summer and fall were in the 97% to 98% range. In the U.S., Leaf River Forest Products brought on its new 335,000-tpy bleached kraft mill, and International Paper Co. started up the 320,000-tpy pulp line at its Georgetown, S.C., mill. Several new mills began production in Europe in 1984 (in Portugal, Austria, and Czechoslovakia). Two major projects in South Africa were scheduled to begin production by year-end.

DOWNTIME NECESSARY. "Whether 1985 will be bad or dreadful for North American mills will depend on how much downtime mills are prepared to take," according to Ross Hay-Roe, publisher of the *PaperTree Letter*. "North American mills are now the world's high-cost producers and will inevitably take the bulk of the downtime in an oversupplied market."

But Canadian and U.S. mills in early December appeared unlikely to take the sort of extensive and widespread downtime necessary to bring the market into better balance. "It appears like the same old story will be repeated where mills overproduce, inventories rise, and prices eventually are driven down to the point where it becomes cheaper for high-cost mills to shut down rather than continue to operate because they will lose less money."

That scenario would suggest that market pulp prices have another $50/ton to decline, with prices possibly bottoming out at around $420 to $440—not much better than their level two years ago, according to Hay-Roe. Prices could then begin to firm later in 1985, but from much lower levels.

BEYOND THE BULGE. Beyond the current bulge, no significant market pulp capacity is planned. A new kraft mill in Finland is scheduled for completion in mid-1985, but it will mainly replace exiting sulfite pulp capacity. Champion International Corp. is scheduled to bring on its 235,000-tpy bleached kraft hardwood pulp mill in Quinnesec, Mich., in early 1986. In the following year, Champion will install a new 195,000-tpy uncoated freesheet machine there.

Georgia-Pacific Corp. and Hammermill Paper Co. are also planning to install new white paper machines at their Port Hudson, La., and Selma, Ala., market pulp mills over the 1986-87 period. Together, these three machines will absorb more than 600,000 tpy of available market pulp. Similar forward-integration projects underway in Scandinavia and Portugal will further reduce market pulp supply, pointing to better balanced markets later this decade. ■

LABOR

MODERATION IN DEMANDS

■ Pulp and paper industry contracts negotiated in 1985 in Canada and the U.S. will reflect trends begun during the economic recession of 1982-83. Still seeking to reduce costs while maximizing efficiency, the paper industry is expected to continue to work for modest labor settlements.

In addition to modified contract terms, negotiations in 1985 will be quieter than in previous years due to the fact that bargaining cycles in both the U.S. and Canada are at their low ebbs.

The American Paper Institute estimates approximately 103 mills in the U.S. will have contracts expiring in 1985 compared with 130 in 1984, and 153 in 1983. The previous lull occurred in 1982 when just 109 contracts came up for renewal.

In Canada, the inception of three-year bargaining cycles was implemented within the past two years. These cycles replace two-year terms that had been in existence since 1978 with contracts in the eastern and western regions of Canada expiring in alternate years. The new cycles will result in 1985 being an off-year during which only spot negotiations will occur at those Canadian mills which have contracts expiring in years different from the regional negotiations.

This will allow Canadian mills to "regroup" on both the employee and employer levels, said a Canadian labor spokesman. "Industrial peace is a period to make improvements in labor relations," he noted.

GROUP TALKS STUDIED. Already in 1984, employers in British Columbia had begun reviewing their labor relations policies, considering changes in their bargaining pattern. A total of 14 pulp and paper companies in the province have for the past three decades bargained jointly through a trade association called the Pulp & Paper Industrial Relations Bureau (PPIRB). That could change, though, by the time the current three-year contract expires in June 1986.

In November 1984, members of the PPIRB applied to have the association deaccredited to allow them the option of withdrawing from group negotiations prior to the start of the next bargaining round. The association is expected to continue to study alternate bargaining procedures through 1985.

In eastern Canada, the unions are expected this year to review ways they might reinforce their positions in contract talks. In recent years, their membership rolls have been somewhat depleted by productivity improvements and loss of members.

The Canadian Paperworkers Union (CPU), the largest Canadian union, indicated late in 1984 that it would consider a merger with another union. Two years earlier its membership had voted down by a narrow margin a proposal to combine with another union.

A merger vote stands a much better chance of passage in 1985, however, because CPU delegates voted at the union's biennial convention in 1984 to allow a motion to pass if over 50% of the membership is in favor, compared with the larger majority required previously.

UNION GOALS CHANGED. Unions will also likely be planning for the resumption of bargaining in 1986 in

MAJOR CONTRACTS BY REGION ON 1985 U.S. PAPER INDUSTRY BARGAINING CALENDAR.

Company	Mill location	Union	No. of employees	Contract expires
New England region				
S.D. Warren (div. Scott Paper)	Westbrook, Maine	A,B,O	346	4/1
Madison Paper	Madison, Maine	U	936	6/1
		U	184	4/30
Pejepscot Paper (Hearst)	Pejepscot, Maine	U,A,O	196	6/15
James River	Berlin, N.H.	U	1,227	6/24
Scott Paper	Winslow, Maine	U,A,O,B	700	6/30
Erving Paper	Erving, Mass. Brattleboro, Vt.	U	489	8/1
Fitchburg Paper (div. Technographics)	Fitchburg, Mass.	O	179	8/15
James River	Groveton, N.H.	U	450	9/1
S.D. Warren (div. Scott Paper)	Skowhegan, Maine	U,B,A	429	9/30
Eastern region				
Westvaco	Tyrone, Pa.	U,B	227	2/17
Scott Paper	Fort Edward, N.Y.	U,B,O	425	3/31
Manning Paper	Troy, N.Y.	U,B,A,O	179	4/1
International Paper	Ticonderoga, N.Y.	U	700	6/1
Riegel Products (div. James River)	Hughesville, N.J.	U,B	53	6/1
	Milford, N.J.	U,B	405	6/1
	Warren Glen, N.J.	U,B	164	6/1
Finch, Pruyn & Co.	Glens Falls, N.Y.	U,A,B,O	587	6/15
Hammermill	Castanea, Pa.	U	108	6/20
	Lock Haven, Pa.	U	563	6/20
Tagsons Papers	Menands, N.Y. Mechanicville, N.Y.	U	226	7/1
Newton Falls	Newton Falls, N.Y.	U	447	8/15
Marcal Paper	Elmwood Park, N.J.	U	732	9/15
Potlatch	Ransom, Pa.	U	360	9/17
Crown Z	S. Glens Falls, N.Y.	U	285	10/1
Appleton Papers	Roaring Springs, Pa.	U	388	11/17
Midwest region				
Simpson Paper	Vicksburg, Mich.	O	240	1/26
Niagara of Wisconsin	Niagara, Wis.	U,O	516	1/31
Miami Paper (div. Pentair)	W. Carrollton, Ohio	U	278	4/5
Boise Cascade	International Falls, Minn.	U,B,A,O	1,250	4/30
Champion	St. Paul, Minn.	U	814	5/1
Scott Paper	Marinette, Wis.	U	563	5/14
	Oconto Falls, Wis.	U	183	5/30
Nekoosa Papers	Nekoosa, Wis.	A,O,U,P	757	5/31
	Port Edwards, Wis.	A,O,U	904	5/31
Owens-Illinois	Tomahawk, Wis.	U,A	354	6/15
St. Regis	Battle Creek, Mich.	B,O	138	6/30
Flambeau Paper (div. Pentair)	Park Falls, Wis.	U	507	7/31
Mead	Chillicothe, Ohio (Chilpaco)	U	729	8/1
	Cincinnati, Ohio	U	145	8/1
	Chillicothe, Ohio (Forms div.)	U	1,342	8/2
Southern region				
Mead	Kingsport, Tenn.	O	816	1/24
Southwest Forest	Panama City, Fla.	U,B,A	660	3/1
Buckeye Cellulose	Memphis, Tenn.	R,O	255	3/7
Jacksonville Paper	Jacksonville, Fla.	U,B	509	6/8
Chesapeake	West Point, Va.	U	559	6/16
Georgia-Pacific	Crossett, Ark.	U,A	1,144	6/30
St. Regis	Pensacola, Fla.	U,B	709	6/30
Union Camp	Franklin, Va.	U,O	1,203	6/30
Westvaco	N. Charleston, S.C.	U,B,A	951	6/30
Owens-Illinois	Orange, Texas	U	357	7/31
St. Joe Paper	Port St. Joe, Fla.	U,B,A	612	7/31
Stone Container	Hopewell, Va.	U	364	7/31
Mead	Lynchburg, Va.	U	401	9/16
International Paper	Vicksburg, Miss.	U,B,O	262	9/26
MacMillan Bloedel	Pine Hill, Ala.	U	397	10/4
International Paper	Pineville, La.	U	227	10/10
Arkansas Kraft	Morrilton, Ark.	U	303	10/14
Container Corp. of America	Brewton, Ala.	U,B,A,O	488	10/15
Tennessee River Pulp & Paper	Counce, Tenn.	U,B	359	10/27
Owens-Illinois	Big Island, Va.	U	253	10/31
Harriman Paperboard	Harriman, Tenn.	A	125	11/14
International Paper	Texarkana, Texas	U,B	638	11/30
Pacific Coast region				
James River	Halsey, Ore.	U,B	492	2/1
Crown Z	Clatskanie, Ore.	U	697	3/31
Garden State Paper	Pomona, Calif.	U	108	4/30
Keyes Fibre	Sacramento, Calif.	U	225	5/1
Simpson Paper	Pomona, Calif.	W	397	6/1
Willamette	Albany, Ore.	W	309	6/1
Simpson Paper	Anderson, Calif.	U	461	6/14
Inland Container	Newark, Calif.	U	43	6/30
Federal Paper Board	Los Angeles, Calif.	U	87	7/31

U—United Paperworkers International Union; W—Association of Western Pulp & Paper Workers; A—International Association of Machinists & Aerospace Workers; B—International Brotherhood of Electrical Workers; O—Others.
Source: American Paper Institute Employee Relations Dept.

British Columbia, determining what their goals will be. They are expected to remain less militant in their approach to negotiations and more modest in their demands than in years prior to the downturn in the industry, observers say.

Since 1981, there have been fewer strikes, and wage demands have been significantly lower than previously. This is expected to continue through 1985 and possibly beyond, depending on market conditions.

Unions in Canada have tended to be more concerned with job security and other monetary issues in recent years—further evidence of an increasing concern over declining membership due to market conditions and industry modernization.

Likewise, unions in British Columbia are likely to resist a move to change the bargaining structure by splitting up the companies that have bargained jointly in the past. This would considerably reduce the unions' collective power by scattering talks throughout the province.

UPIU LOCAL
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ON STRIKE

Labor's demands are expected to be more moderate in 1985.

Companies, on the other hand, question the advantage of continuing to bargain together. The last round of joint talks in British Columbia dragged on for more than 14 months, during which the unions were locked out for two months, causing considerable loss in production and customer confidence.

COST CUTTING A PRIORITY. In the U.S., unions have problems similar to those of their counterparts in Canada: dwindling membership, less clout at the bargaining table, and loss of jobs to technology, among other things. In the past three years, U.S. unions have given way in an increasing number of cases to cost-cutting measures sought by employers in an effort to remain competitive.

With the economy expected to be relatively flat, the dollar relatively strong, and inflation modest in 1985, companies are expected to maintain a belt-tightening stance in contract talks. In addition, unemployment is expected to remain relatively high, causing unions to remain more amenable to modest contract settlements.

The Conference Board expects unemployment will be flat in 1985, staying at about 7.2%, with some sectors continuing to trim their staffs. "Most of the heavy manufacturing companies still have too many people who are underutilized," the board noted.

Wage increases will also remain modest in 1985, the Conference Board indicated. Average hourly earnings in the private sector are expected to advance by 3.5%, while unit manufacturing costs will rise by 2.5%. In the unionized sector, first-year benefits and wages are likely to go up 4%.

According to American Paper Institute employee relations vice president, Richard Klinzing, health care cost containment will be one of the major issues in 1985. "The containment of rising health care costs requires continued efforts; it's not something that can be effectively dealt with in a short period of time," he said.

Companies are also likely to continue to seek greater flexibility in assigning jobs and scheduling output. Production restrictions on holidays will continue to be one of their targets. Greater freedom in assigning jobs using such procedures as the team concept will also be sought in an effort to improve the companies' competitive positions.

WESTERN HEADWAY. Considerable progress was made in 1984 in giving employers more say in the use of their work force. Probably the most significant steps were made on the West Coast where companies resisted union efforts to fight implementation of flexible work assignment programs. Long strikes became rampant, but mills were run with salaried staff.

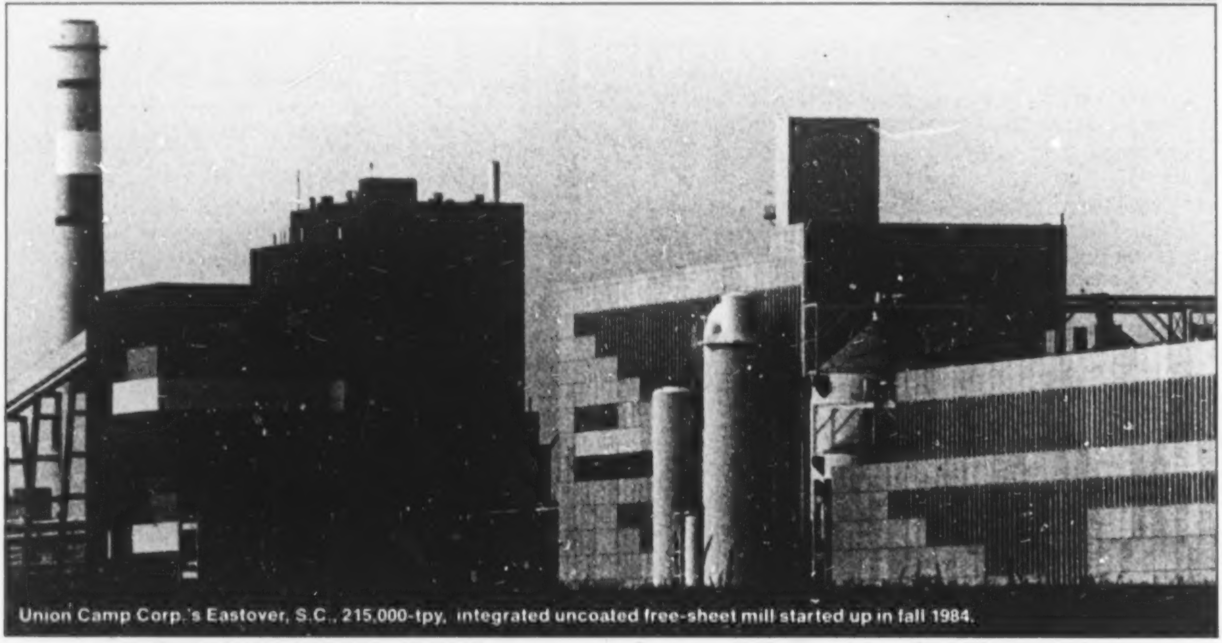
Crown Zellerbach Corp. took one of the stronger stands, permanently closing its Los Angeles, Calif., mill. Shortly afterward, workers approved the company's offers at some of its other mills. In addition, many West Coast mills negotiated contracts initiating employee contributions to health care plans.

West Coast labor settlements were a lot lower than in other parts of the country in 1984, resulting in base wage rates more in line with the rest of the country. Likewise, more modest increases in Canada will result in eastern Canadian rates being close to British Columbia wages by 1986—the first time the regions have attained parity.

Canadian pay in U.S. dollars was higher than U.S. wages during 1975-77, about the same as the U.S. in 1978-83, but dropped sharply in 1984, according to the publication *Canadian Paper Analyst*. This reflected not only a lower rate of pay increases negotiated, but also a significant decline in the value of the Canadian dollar against its U.S. equivalent.

With relatively little bargaining anticipated in the Canadian industry, and fewer contracts expiring in the U.S. than in the past two years, plus a flat economic picture for 1985, the year should be calm.

1985 could mark a major turning point for many companies, though. Studies that are to be conducted this year could change the way some companies bargain in years to come. The bargaining procedure for the entire British Columbia pulp and paper industry could be overhauled and the CPU's membership structure could be changed drastically.



Union Camp Corp.'s Eastover, S.C., 215,000-tpy, integrated uncoated free-sheet mill started up in fall 1984.

CAPITAL SPENDING

The latest round of capacity additions lifts industry's North American capital spending plans to new highs

By CARL ESPE, News Editor and
STEPHANIE POLLITZER, Consulting Editor

■ Encouraged by strong demand, high operating rates, and greatly improved earnings, papermakers in the U.S. stepped up their capital spending plans to new highs in 1984, while Canadian producers raised their sights substantially from the depressed spending levels of the past several years. *Pulp & Paper Project Report's* annual survey of spending plans at North American pulp and paper mills shows planned expenditures up 27% compared with the previous year's survey. U.S. papermakers plan to spend $8.2 billion for the 1984-86 survey period, up from $6.5 billion in the previous year, while Canadian spending totals C$4.6 billion, up from $3.6 billion.

Responding to tight markets, a number of companies announced plans in 1984 for new paper machines as well as several greenfield mills, which has boosted spending totals in both the U.S. and Canada. The lower inflation rate and attractive financial incentives, such as the 1981 depreciation allowance in the U.S., have also encouraged higher spending, according to analysts. Another factor is the strong dollar, which has made overseas competition tougher for U.S. producers, underscoring the need for modern, efficient operations.

Commerce expects record. Paper companies planned to spend a record $7.13 billion in 1984 on new plant and equipment, up 15.4% from 1983 spending of $6.18 billion, according to a Commerce Dept. survey conducted in July and August 1984. Spending for new plant and equipment at U.S. paper mills reached a seasonally adjusted annual rate of $6.93 billion in the first quarter and $7.05 billion in the second quarter. Spending was expected to increase to an annual rate of $7.25 billion in the third quarter and $7.28 billion in the fourth quarter, easily surpassing the old mark. Industry expenditures peaked in 1980 at $6.80 billion before dropping during the recession to a low of $5.97 billion in 1982.

In its annual fall survey of U.S. business's capital spending plans, McGraw-Hill Economics forecast U.S. paper industry outlays of $6.83 billion in 1984, up 10.5% from 1983. According to the survey, paper industry capital outlays will reach record highs in 1985 and 1986: $7.51 billion this year, up 9.9% compared with 1984 and $8.07 billion in 1986—an additional 7.5% rise.

Canadians back on track. Although they have a long way to go before matching prerecession spending levels, Canadian producers now seem to be heading in the right direction. Canadian producers planned capital expenditures of C$1.27 billion in 1984, up 19.8% from $1.06 billion in 1983, according to Statistics Canada's mid-1984 review. Spending for new machinery and equipment was expected to rise 20.4% over 1983, to $1.12 billion.

ABOUT THE SURVEY DATA. The tables and lists in this report are compiled from *Pulp & Paper Project Report's* annual survey of expansion/modernization programs at U.S. and Canadian mills. The dollar figures represent the total cost of reported projects and sometimes may include supporting equipment. The total cost of multiyear projects is assigned to the startup year and is not divided among the years of expenditure.

Assignment of cost data to various categories—pulping, for example—is based on data from reporting companies whenever available. When such cost breakdowns are not provided, the figures reflect an estimate by *P&P* staff. Guidelines in assigning cost data to categories include the following: recovery boiler projects are listed under "pulping" unless identified as environmental; expenditures for large new machine installations or greenfield mills are divided among the categories, presuming a reasonable assumption of proportionate costs; the "miscellaneous/plant" category includes coating and finishing operations, as well as plant and building structures and projects reported as miscellaneous.

P&P's exclusive survey of capital spending programs for 1984-86 by companies lists programs for new mills and machines, rebuilds and modernizations, plant improvements, with specifics of equipment ordered, suppliers, and price (where reported). Separate listings show projects for environmental control. The survey is not published in the magazine but is available as a separate booklet. Price: $85; free to subscribers to P&P Project Report. To order: send payment (in US$) to Pulp & Paper, Editorial Dept., 500 Howard St., San Francisco, Calif. 94105.

UNITED STATES

Capacity additions boost spending growth; environmental outlays fall

■ U.S. pulp and paper companies plan to spend $7.75 billion for production-related projects in the 1984-86 survey period, up 32.9% from the 1983-85 period. That total includes an estimated $1.02 billion in projects scheduled for completion in 1987 or later. Production-related spending accounts for 94% of total outlays in the current survey, up from 90% last year.

Last year's survey showed an emerging emphasis on incremental production expansion through rebuilds and modification of existing equipment, and this year's results confirm that trend. Outlays for machine modification amount to 13% of overall capital spending in the 1984-86 period, the current survey shows—up from 11% last year and from only 6% the year before.

On the strength of a new round of capacity additions in several grades, outlays for new paper machines showed the largest percentage jump in this year's sur-

SEVEN-YEAR CAPITAL SPENDING TRENDS

UNITED STATES

P&P's reported three-year spending ($ billion)

Year	Period	Production	Environment		Total	Annual capital expenditures[1]
			Water	Air		
1985	1984-86	$6.733[2]	$0.172[2,3]	$0.270[2]	$7.175[2]	$ (7.70)[4]
1984	1983-85	4.857[2]	0.271[2,3]	0.325[2]	5.452[2]	7.13
1983	1982-84	6.095[2]	0.376[2,3]	0.460	6.931[2]	6.19
1982	1981-83	6.216[2]	0.635[3]	0.677	7.528[2]	5.97
1981	1980-82	7.783[2]	0.531	0.568	8.882[2]	6.72
1980	1979-81	8.003[2]	0.515	0.360	8.001[2]	6.80
1979	1978-80	4.911	0.350	0.251	5.759[5]	5.55

1. Based on data from U.S. Commerce Dept.
2. Based on *P & P* survey for 3-year period; not comparable to U.S. Commerce data since *P & P* information can include only dollar amounts that have been released publicly. Please note: 1985 data does not include $1.058 billion for projects to be completed in 1987 or later ($1.021 billion production; $0.037 billion environmental); 1984 data does not include $1.018 billion for projects to be completed in 1986 or later ($0.977 billion production; $0.041 billion environmental); 1983 data does not include $1.292 billion for projects to be completed in 1985 or later; 1982 data does not include $2.8 billion estimated for projects to be completed in 1984-86; 1981 data does not include $1.150 billion estimated to be spent in 1983-85; 1980 data does not include $0.877 billion estimated to be spent in 1982-85.
3. 1985 data includes $0.022 billion for "solid waste" or unspecified; 1984 data includes $0.028 billion for "solid waste/unspecified;" 1983 data includes $0.015 billion for "solid waste/unspecified;" 1982 data includes $0.050 billion for "solid waste."
4. *P & P* estimate. 5. Includes unallocated funds of $0.246 billion for 1979 and $0.140 billion for 1978 surveys.

CANADA

P&P's reported three-year spending (C$ billion)

Year	Period	Production	Environment		Total	Annual capital expenditures[1]
			Water	Air		
1985	1984-86	C$3.626[2]	C$0.119[3]	C$0.124	C$3.870	C$ (1.15)[4]
1984	1983-85	3.166[2]	0.221[3]	0.189	3.557	1.09
1983	1982-84	3.990	0.295[3]	0.272	4.557[2]	1.06
1982	1981-83	3.949[2]	0.438[3]	0.365	4.752[2]	1.83
1981	1980-82	3.645[2]	0.303	0.329	4.277[2]	1.87
1980	1979-81	2.440[2]	0.187	0.135	2.078[2]	1.32
1979	1978-80	1.462	0.110	0.113	1.685	0.73

1. Data from Statistics Canada (excludes repair expenditures).
2. Based on *P & P* survey for 3-year period; not comparable to Statistics Canada data since *P & P* information can include only dollar amounts that have been released publicly. Please note: 1985 data does not include C$0.697 billion for projects to be completed in 1987 or later (C$0.669 billion production; C$0.028 billion environmental); 1984 data does not include C$0.502 billion for projects to be completed in 1986 and later (C$0.385 billion production; C$0.117 environmental); 1983 data does not include C$0.697 billion for projects to be completed in 1985 and later; 1982 data does not include C$0.814 billion estimated for projects to be completed in 1984-86; 1981 data does not include $0.643 billion estimated to be spent in 1982-85.
3. 1985 data includes C$0.007 billion for "solid waste" or unspecific; 1984 data includes C$0.005 billion for "solid waste;" 1983 data includes C$0.002 billion, and 1982 data includes C$0.031 billion designated for "solid waste" control. 4. *P & P* estimate.

vey, rising from 5% last year to 10% at present.

SOUTH STILL SHOWS THE WAY. Although the South still accounts for 60% of planned U.S. outlays, the latest figures do represent a dropoff from the South's 65% share in last year's survey. Spending programs in the South amount to $4.96 billion for the 1984-86 survey period. Major projects underway in the South include greenfield mills in South Carolina and Mississippi and major expansions in Alabama and South Carolina.

Total spending of $1.45 billion in South Carolina and $1.45 billion in Alabama make those two states the leaders for the third year in a row. Other leading southern states are Mississippi, at $560.0 million, and Louisiana, at $315.8 million.

Accounting for 17% of the U.S. total, the Midwest remains second in regional spending with total outlays of $1.34 billion. Michigan, with a large greenfield mill under construction, leads the region with $603.1 million in total spending, followed by Wisconsin with $560.9 million. Spending in the West climbed from 9% of the U.S. total in 1983 to 14% last year, and this year's survey shows spending of $1.19 billion, holding steady at 14%. A major expansion project and a greenfield mill make Washington state the leader in the West, with $764.6 million in total planned spending.

TOP SPENDERS IN U.S.

Companies which have reported capital spending plans of $100,000,000 or more, including both production and environmental programs

	1984-86	1983-85
Champion International	$1,118,442,000	$733,380,000*
International Paper	804,000,000	540,000,000
Union Camp	644,680,000	591,307,000
Great Northern Nekoosa	602,950,000	600,450,000
Bowater Inc.	531,130,000	148,910,000
Crown Zellerbach	529,000,000	454,000,000
Scott Paper	453,500,000	435,200,000
Hammermill Paper	369,651,000	130,722,000
Westvaco	310,100,000	129,100,000
Georgia-Pacific	300,800,000	n.a.
James River	300,470,000*	n.a.
Consolidated Paper	298,950,000*	96,100,000
Great Lakes/Ponderay	210,000,000*	—
Temple-Inland	194,800,000	n.a.
Potlatch	186,720,000*	44,253,000
Fort Howard Paper	173,500,000	132,000,000*
Pentair Industries	152,215,000*	121,715,000*
Mead	134,000,000	68,000,000
Chesapeake	110,000,000	57,500,000

*Includes programs for completion beyond 3-year period indicated.

Total cost of a multiyear project is assigned to year of startup.

REPORTED SPENDING 1984-86+, BY TYPE OF FACILITY[1]

UNITED STATES		
Wood/fiber	$ 416,968,000	5%
Pulping	1,748,062,000	21%
New machines	790,500,000	10%
Machine modifications	1,086,515,000	13%
Energy/power	1,651,754,000	20%
Miscellaneous/plant	2,059,463,000	25%
Production total	**$7,753,262,000**	**94%**
Water quality	$ 170,921,000	2%
Air quality	285,610,000	4%
Solid wate/unspecified	22,400,000	0%
Environmental total	**$ 478,931,000**	**6%**
Total spending	**$8,232,193,000**	**100%**
CANADA		
Wood/fiber	C$ 109,033,000	2%
Pulping	1,097,463,000	24%
New machines	476,000,000	10%
Machine modifications	1,159,244,000	26%
Energy/power	262,844,000	6%
Miscellaneous/plant	1,191,054,000	26%
Production total	**C$4,295,638,000**	**94%**
Water quality	C$ 132,410,000	3%
Air quality	132,465,000	3%
Solid wate/unspecified	6,730,000	0%
Environmental total	**C$ 271,605,000**	**6%**
Total spending	**C$4,567,243,000**	**100%**

1. Includes projects as announced for completion in 1987 and later, as reported by *Pulp & Paper Project Report*.
2. Dollar figure includes an estimated $1,057,500,000 for projects to be completed in 1987 and later ($1,020,750,000 production; $36,750,000 environmental).
3. Dollar figure includes an estimated C$697,481,000 for projects to be completed in 1986 and later (C$669,581,000 production; $C27,900,000 environmental).

SUMMARY OF U.S. PROJECTS— REPORTED EXPENDITURES, 1984-86[1] BY STATES (000 dollars)

STATE	PRODUCTION	ENVIRON-MENTAL	TOTAL
Alabama	$1,208,700	$ 1,391	**$1,210,091**
Arkansas	127,295	1,206	**128,501**
California	145,565	20,034	**165,599**
Connecticut	32,400	—	**32,400**
Florida	83,150	13,300	**96,450**
Georgia	121,222	11,700	**132,922**
Idaho	164,559	54	**64,613**
Indiana	1,036	—	**1,036**
Kentucky	42,000	—	**42,000**
Louisiana	297,900	17,850	**315,750**
Maine	254,663	15,450	**270,113**
Maryland	—	2,100	**2,100**
Michigan	526,970	76,147	**603,117**
Minnesota	38,608	11,129	**49,737**
Mississippi	476,000	84,000	**560,000**
Montana	7,600	—	**7,600**
New Hampshire	103,100	—	**103,100**
New Jersey	9,765	300	**10,065**
New York	75,300	—	**75,300**
North Carolina	84,900	21,300	**106,200**
Ohio	118,253	6,895	**125,148**
Oklahoma	115,000	—	**115,000**
Oregon	77,920	1,445	**79,365**
Pennsylvania	250,909	25	**250,934**
South Carolina	1,451,100	99,530	**1,550,630**
Tennessee	81,000	15,500	**96,500**
Texas	179,364	18,100	**197,464**
Virginia	404,342	6,250	**410,592**
Washington	733,100	31,500	**764,600**
West Virginia	250	4,150	**4,400**
Wisconsin	541,291	19,575	**560,866**
Total	**$7,753,262**	**$478,931**	**$8,232,193[2]**

1. Includes projects, as announced, for completion in 1987 or later.
2. Dollar figure includes estimated $1,057,500,000 for projects to be completed in 1986 and after ($1,020,750,000 production; $36,750,000 environmental).

Spending in the Northeast is reported at $741.9 million for the 1984-86 survey period, or 5% of the U.S. total, with $270.1 million earmarked for Maine.

SPENDING BY CATEGORIES. Capacity additions are responsible for a large portion of the planned increase. Spending for new paper machines rose from 5% in the last survey to 10% in the current period, or $790.5 million. Expenditures for paper machine modifications continued to outstrip spending for new machines, however, despite the big jump in new machine announcements. In contrast, spending for machine modifications represented less than 80% of new machine expenditures in the 1982-84 survey period, and an average of only 54% in the early 1980s, when the last round of capacity additions was in full swing. Spending for machine modifications are reported at $1.09 billion in the current period, or 13% of the U.S. total, up from 11% in the 1983-85 period.

Outlays for energy and power facilities in the 1984-86 survey period total $1.65 billion, or 20% of U.S. spending, down 7% compared with the 1983-85 survey figures. The dropoff reflects the completion of four large boiler projects in 1983 and the postponement of several others.

Spending for wood and fiber projects in the 1984-86 survey period is reported at $417.0 million, or 5% of total outlays, while pulping projects amount to $1.75 billion, or 21% of U.S. expenditures. Neither category deviates significantly from last year's results.

Continuing to decline from the peak reached in the 1970s, environmental spending is expected to total only $478.9 million in the 1984-86 survey period, or 10% of total spending. This represents a 24.8% drop from last year's results. Expenditures for air quality ($285.6 million) outrank those for water quality ($170.9 million), as they have for the past five years. Solid waste programs total a modest $22.4 million, according to the survey, down from $28.2 million last year.

NEW MILLS AND MACHINES. Two greenfield mills started up late last year, and construction is now underway at two other sites. At Eastover, S.C., Union Camp Corp.'s 210,000-tpy uncoated free-sheet mill came onstream in September 1984. Also in September, Great Northern Nekoosa Corp. started up its 350,000-tpy bleached kraft market pulp mill at New Augusta, Miss. Temple-Inland Inc.'s 175,000-tpy recycled linerboard mill in Ontario, Calif., is scheduled to come online in late 1985, followed in 1986 by Champion International Corp.'s 750-tpd bleached kraft market pulp mill at Quinnesec, Mich. Champion has also recently announced plans to install a 500- to 600-tpd uncoated free-sheet machine at the Quinnesec mill in 1987.

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN U.S.

(over $50,000,000 at an existing mill site)

Appleton Papers, Combined Locks, Wis.	$ 54,900,000
Bowater/Catawba Newsprint, Catawba, S.C.	64,350,000
Bowater Carolina, Catawba, S.C.	375,280,000*
Bowater Southern, Calhoun, Tenn.	91,500,000
Champion International, Canton, N.C.	66,500,000
Champion International, Bucksport, Maine	141,013,000
Champion International, Lufkin, Texas	89,266,000
Chesapeake, West Point, Va.	110,000,000*
Consolidated/Biron Div., Wisconsin Rapids, Wis.	229,850,000*†
Container Corp. of America, Fernandina Beach, Fla.	50,000,000
Crown Zellerbach, South Glens Falls, N.Y.	67,000,000*
Crown Zellerbach, Camas, Wash.	431,000,000*
Fort Howard Paper, Muskogee, Okla.	115,000,000*
Fort Howard Paper, Green Bay, Wis.	58,500,000*
Georgia-Pacific, Crossett, Ark.	100,000,000*
Georgia-Pacific (Port Hudson), Zachary, La.	200,000,000*
Gulf States Paper, Demopolis, Ala.	51,400,000*†
Hammermill Paper, Selma, Ala.	254,300,000*†
Hammermill Paper, Erie, Pa.	74,100,000
International Paper, Mobile, Ala.	300,000,000
International Paper, Georgetown, S.C.	475,000,000
James River (Naheola), Pennington, Ala.	65,000,000*
James River, Berlin, N.H.	50,000,000
Kimberly-Clark Coosa Pines, Ala.	77,500,000
Mead, Chillicothe, Ohio	100,000,000
Pentair Industries, Niagara, Wis.	86,300,000
Potlatch, Lewiston, Idaho	163,638,000†
Scott Paper, Mobile, Ala.	300,000,000
Scott Paper, Chester, Pa.	115,000,000
Temple-Inland, Evadale, Texas	62,800,000
Westvaco, Charleston, S.C.	90,000,000
Westvaco, Covington, Va.	180,000,000*

*Includes new paper machine (also in listing of New Machines).
†Includes programs for completion in 1987 and later.

Data in this table necessarily omits expansion programs for which cost information has not been released.

GREENFIELD MILLS—PROJECTS IN U.S.

UNDER CONSTRUCTION OR STARTED UP IN 1984	**STARTUP**
Champion International, Quinnesec, Mich. 750-tpd bleached hardwood kraft pulp mill; 500- to 600-tpd uncoated free-sheet machine planned for 1987*	**1986**
GNN/Leaf River Forest Products, New Augusta, Miss. 350,000-tpy bleached hardwood and softwood kraft pulp mill	**1984**
Temple-Inland, Ontario, Calif. 175,000-tpy recycled linerboard mill*	**1985**
Union Camp, Eastover, S.C. 210,000-tpy uncoated free-sheet mill*	**1984**

ANNOUNCED, WITH STARTUP DATE

Great Lakes/Ponderay Paper, Usk, Wash. 154,000-tpy TMP/newsprint mill*	**1987**

PROPOSED (NO DATE)

Augusta Kraft, Augusta, Ga.
Proposed 262,500-tpy kraft linerboard mill
Boise Cascade, S.C.
Proposed 800-tpd bleached kraft pulp mill, with possible later addition of newsprint or white paper capacity
Carolina Forest Industries, Bennetsville, S.C.
Proposed two-machine, 1,500-tpd TMP/newsprint mill
Champion International, Halifax, N.C.
Proposed bleached pulp/white paper mill studied
Champion International, Jasper, Texas
Proposed 1,000-tpd mill, kraft linerboard or white paper
Fort Howard, Southeast
Reportedly considering tissue mill
Georgia Kraft, Elberton, Ga.
Site purchased in 1981 for future 1,300-tpd linerboard mill
Grenada Paper, Grenada, Miss.
Proposed 215,000-tpy TMP/newsprint mill
Independent Kraft, Tuscaloosa, Ala.
280,000-tpy kraft linerboard mill, construction expected to begin in 1985*
Kimberly-Clark, Southeast
Reportedly considering disposable diaper pulp mill

*Machine is also included in New Machines listings.

Construction is scheduled to begin this year on Independent Kraft Corp.'s 280,000-tpy kraft linerboard mill in Tuscaloosa, Ala., although no startup date has been set. And a 154,000-tpy newsprint mill is scheduled to be built at Usk, Wash., by Great Lakes Forest Products Ltd. in association with several newspaper publishers. Announced just last month, the mill is scheduled for 1987 startup.

Four new paper machines started up in 1984 at U.S. mills, while an additional five units were scheduled to come online in 1985. Crown Zellerbach Corp. started up its new 160,000-tpy uncoated free-sheet unit at Camas, Wash., in July 1984, while Union Camp brought its Eastover machine online in September. Fort Howard Paper Co. began operating a new 250-tpd tissue machine at Green Bay, Wis., in August, while Cascades Industries Inc. started up its 50-tpd tissue machine—built with used components—at Rockingham, N.C., in October.

Scheduled for startup in 1985 are a new 275- to 300-tpd uncoated free-sheet machine at Georgia-Pacific Corp.'s Crossett, Ark., mill and two tissue machines, one at Crown Zellerbach's South Glens Falls, N.Y., mill and the other—a used machine—at Laurel Hill Paper Co. in Cordova, N.C. Also in 1985, Temple-Inland will bring online its 175,000-tpy recycled linerboard machine at Ontario, Calif., and Chesapeake Corp. will start up a new 900-tpd kraft linerboard machine at West Point, Va.

Six new machines have been announced for 1986 startup, while four are scheduled to come online in 1987. 1986 startups include tissue machines for Fort Naheola mill at Pennington, Ala., and Little Rapids Corp.'s mill in Potsdam, N.Y. Westvaco Corp. has announced plans to install a bleached paperboard machine at Covington, Va., in 1986.

Uncoated free-sheet machines are planned for G-P's Port Hudson, La., mill in 1986, Hammermill Paper Co.'s Selma, Ala., mill in 1987, and Champion's Quinnesec mill in 1987. Bowater Inc.'s Bowater Carolina mill in Catawba, S.C., will bring a lightweight coated paper machine onstream in 1986, while Consolidated Papers Inc.'s Biron Div. plans a lightweight coated machine at Wisconsin Rapids, Wis., in 1987. Finally, Great Lakes' Ponderay Paper mill in Usk, Wash., is expected to start up its new 154,000-tpy newsprint machine in 1987.

THE BIG SPENDERS. Most major U.S. paper companies plan to either increase capital spending or hold it at relatively high levels, according to recent annual reports. International Paper Co., for example, plans to spend $804 million as it completes its Georgetown, S.C., mill modernization and begins to restructure its Mobile, Ala., mill. Crown Zellerbach and Scott Paper are in the middle of ambitious, multiyear programs to modernize and restructure their operations. And a long list of companies—including James River, Bowater, Consolidated, Westvaco, and Hammermill—have recently announced major spending increases. One exception is Champion, however, which is expected to cut back its capital spending plans since the recent acquisition of St. Regis Corp.

UNITED STATES—REPORTED CAPITAL EXPENDITURES FOR 1984-86+[1] BY REGIONS AND BY TYPE OF FACILITY ($000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
New England	$ —	0%	$ 83,300	5%	$ —	0%	$ 124,636	12%	$ 143,727	9%	$ 38,500	2%
Mid-Atlantic	18,800	5%	20,000	1%	10,000	1%	109,341	10%	131,936	8%	45,897	2%
East North Central	72,638	17%	310,450	18%	60,000	8%	235,873	22%	175,065	10%	333,524	16%
West North Central	—	0%	—	0%	—	0%	4,615	0%	23,852	1%	10,141	0%
South Atlantic	153,280	37%	478,432	27%	360,500	45%	252,829	23%	290,301	18%	609,622	30%
East South Central	102,240	25%	467,500	27%	100,000	13%	170,000	16%	488,680	30%	476,280	23%
West South Central	22,000	5%	138,315	8%	110,000	14%	111,568	10%	122,521	7%	213,655	11%
Mountain/Pacific	48,010	11%	250,065	14%	150,000	19%	77,653	7%	275,672	17%	331,844	16%
Total	**$ 416,968**		**$1,748,062**		**$ 790,500**		**$1,086,515**		**$1,651,754**		**$2,059,463**	

ENVIRONMENTAL QUALITY SPENDING / **TOTALS:**

	WATER		AIR		WASTE/UNSPEC.		PRODUCTION		ENVIRONMENT		GRAND TOTAL	
New England	$ —	0%	$ 13,950	5%	$ 1,500	7%	$ 390,163	5%	$ 15,450	3%	$ 405,613	5%
Mid-Atlantic	325	0%	—	0%	—	0%	335,974	4%	325	0%	336,299	4%
East North Central	41,958	25%	61,019	21%	—	0%	1,187,550	15%	102,617	22%	1,290,167	16%
West North Central	447	0%	7,082	2%	3,600	16%	38,608	0%	11,129	2%	49,737	1%
South Atlantic	50,125	29%	96,655	34%	11,550	52%	2,144,964	28%	158,330	33%	2,303,294	28%
East South Central	44,475	26%	55,900	20%	516	2%	1,804,700	24%	100,891	21%	1,905,591	23%
West South Central	7,942	5%	24,514	9%	4,700	21%	718,059	9%	37,156	8%	755,215	9%
Mountain/Pacific	26,009	15%	26,490	9%	534	2%	1,133,244	15%	53,033	11%	1,186,277	14%
Total	**$ 170,921**		**$ 285,610**		**$22,400**		**$7,753,262**		**$ 478,931**		**$8,232,193[2]**	

1. Includes projects, as announced, for completion in 1987 and later.
2. Dollar total includes estimated $1,057,500,000 for projects to be completed in 1986 and after ($1,020,750,000 production; $36,750,000 environmental).

Regions are as follows:
New England: Maine, Vt., N.H., Conn., R.I., Mass.
Mid-Atlantic: N.Y., N.J., Pa.
East North Central: Wis., Mich., Ill., Ind., Ohio
West North Central: N.Dak., S.Dak., Nebr., Kans., Minn., Iowa, Mo.
South Atlantic: Del., Md., W.Va., Va., N.C., S.C., Ga., Fla.
East South Central: Ky., Tenn., Miss., Ala.
West South Central: Okla., Texas, Ark., La.
Mountain/Pacific: Wash., Ore., Calif., Alaska, Idaho, Nev., Mont., Wyo., Utah, Ariz., Colo., N.Mex.

NEW PAPER MACHINES IN U.S.

UNDER CONSTRUCTION OR STARTED UP IN 1984	STARTUP
Cascades Industries, Rockingham, N.C. 50-tpd, 3,500-fpm, from used parts—tissue	1984
Chesapeake Corp., West Point, Va. 900-tpd, 258-in. Voith No. 3—linerboard	1985
Crown Zellerbach, South Glens Falls, N.Y. 6,000-fpm twin-wire—tissue	1985
Crown Zellerbach, Camas, Wash. 160,000-tpy, 276-in.-trim, Beloit twin-wire—uncoated free sheet	1984
Fort Howard, Green Bay, Wis. 250-tpd, 270-in. No. 10 Beloit twin-wire—tissue	1984
Georgia-Pacific, Crossett, Ark. 275- to 300-tpd, 280-in. No. 1 Sulzer Escher Wyss—uncoated free sheet	1985
Laurel Hill Paper, Cordova, N.C. Used 50-tpd machine from James River mill—tissue	1985
Temple-Inland, Ontario, Calif. 175,000-tpy, 280-in. Tampella—recycled linerboard	1985
Union Camp, Eastover, S.C. 210,000-tpy, 372-in. Voith—uncoated free sheet	1984
ANNOUNCED, WITH STARTUP DATE	**DATE**
Bowater Carolina, Catawba, S.C. 197,000-tpy, 336-in., 3,500-fpm Beloit—lightweight coated	1986
Champion International, Quinnesec, Mich. 500- to 600-tpd machine—uncoated free sheet	1987
Consolidated Paper/Biron Div., Wisconsin Rapids, Wis. 500-tpd, 288-in.-trim, 3,700-fpm Voith—lightweight coated	1987
Fort Howard, Muskogee, Okla. No. 4 machine—tissue	1986
Georgia-Pacific (Port Hudson), Zachary, La. 230,000-tpy, 378-in., 3,500-fpm Valmet—uncoated free sheet	1986
Great Lakes/Ponderay Paper, Usk, Wash. 154,000-tpy, 300-in.-trim twin-wire—newsprint	1987
Hammermill, Selma, Ala. 185,000-tpy, 350-in. Voith—uncoated free sheet	1987
James River, Pennington, Ala. 70,000-tpy, 260-in., 6,000-fpm Beloit twin-wire—tissue	1986
Little Rapids Corp., Potsdam, N.Y. Used 50-tpd unit from Kimberly-Clark mill—tissue	1986
Westvaco, Covington, Va. 175,000-tpy, 278-in.-trim Voith—bleached paperboard	1986
PROPOSED (NO DATE)	
Blandin Paper, Grand Rapids, Minn. Proposed 170,000- to 180,000-tpd machine—lightweight coated	
Boise Cascade, International Falls, Minn. Proposed new machine, on hold—uncoated free sheet	
Champion International, unspecified Proposed machine for St. Regis mill—lightweight coated	
Independent Kraft, Tuscaloosa, Ala 280,000-tpy, 256-in.-trim; construction expected to begin in 1985—linerboard	
Longview Fibre, Longview, Wash. No. 12 machine—lightweight coated	
Midtec Paper, Kimberly, Wis. Studying new No. 7 machine—premium coated paper	
Owens-Illinois, Tomahawk, Wis. New machine to replace existing unit—corrugating medium	
Philip Morris/Wisconsin Tissue, Menasha, Wis. No. 4 twin wire, for probable 1986 startup—tissue	
Potlatch, McGehee, Ark. Possible second machine—solid bleached paperboard	
Southeast Paper, Dublin, Ga. Proposed second 450-tpd machine—recycled newsprint	
Tagsons Paper, Mechanicsville, N.Y. Reportedly considering new machine—tissue	
Union Camp, Eastover, S.C. Reportedly considering second machine—coated or uncoated free sheet	
Westvaco, unspecified 150,000-tpy machine, 1985 announcement expected—coated free sheet	
Weyerhaeuser, Columbus, Miss. Addition of two machines postponed—uncoated free sheet, coated groundwood	

CANADA

Upgrades lead spending rise; eastern firms dominate spending plans

■ Although slower to realize the benefits of the economic recovery than their U.S. counterparts, Canadian producers have taken their first steps toward rebuilding capital spending budgets to prerecession levels, *Pulp & Paper Project Report*'s 1984-86 capital spending survey shows. Canadian pulp and paper mills report plans to spend C$4.57 billion in the 1984-86 period, including $697.5 million in projects to be completed after 1986. This $4.57 billion is 27.7% higher than the $3.58 billion reported in last year's survey. In comparison, Canadian pulp and paper companies planned to spend $4.92 billion in the 1980-82 survey period, $5.57 billion from 1981 to 1983, and $5.25 billion in the 1982-84 period.

Quebec out in front. Mills in Quebec plan expenditures of $2.41 billion in the current survey period, or 53% of total Canadian outlays, up from 40% of total capital spending reported last year. Well over half of Quebec's total comes from four large projects, however, including Domtar Inc.'s $773-million, multiyear modernization at Windsor and expansion projects at Reed Inc., James Maclaren Industries Inc., and Donohue Inc. mills.

Capital outlays in second-place Ontario total $845 million in the 1984-86 survey, or 19% of total Canadian expenditures. Last year, Ontario's share amounted to 31% of overall spending. Only two projects in Ontario exceed $100 million in this year's results: Boise Cascade Canada Ltd.'s Kenora modernization and E.B. Eddy Forest Products Ltd.'s Espanola upgrade.

While continuing to lag the eastern regions, western Canada reported significant increases this year in spending plans. Expenditures in British Columbia and Alberta reported in the current survey total $643.9 million, or 14% of the Canadian total—double last year's 7% share of overall spending plans, the survey shows. Though much improved compared with last year, western spending still trails the $995 million mark reported in the 1983 survey by a wide margin.

COMPANY PLANS. Sixteen Canadian companies reported capital spending plans in excess of $100 million for the survey period, up from ten in last year's survey. Five of these top spenders include projects for completion beyond the 1986 cutoff date. Domtar's $1.02-billion total is almost four times higher than the next closest figure, Abitibi-Price Inc.'s $272.2 million.

Expansion plans reported in the 1984-86 survey period include 22 programs at existing mill sites, which are expected to exceed $50 million, up from 17 last year. The largest such program is Domtar's $773.0-million Windsor expansion, which includes two new paper machines. Reed Inc.'s multiyear expansion at Quebec City is reported at $260 million, while Western Pulp Inc.'s Squamish, B.C., upgrade is budgeted at $214 million, followed by Boise Cascade Canada's $210-million expansion at Kenora.

Spending by categories. Capital expenditures for pulp production normally account for 35% or more of Canadian spending, *P&P*'s surveys show. In contrast to past years, however, this year's survey shows pulp projects totaling only $1.10 billion in the 1984-86 survey period, or 24% of total capital outlays. Also down sharply are energy expenditures, which fell to 6% of the total this year from 11% last year, and environmental outlays, down to 6% this year from 12% in the 1983-85 period.

The major change in the current period is the shift away from pulping and energy projects toward capacity-expanding machine modifications and new paper machines. Machine modification projects have been the fastest growing segment of Canadian expenditures in the past two surveys. This year's total of $1.16 billion for 1984-86 represents 26% of total spending, up from a 14% share last year and only 5% in 1983.

Spending for new machines is reported at $476 million for the survey period, up from $215 million last year. This year's total represents 10% of total outlays, up from 5% last year—and more in keeping with the 12% level reported by Canadian firms before the recession.

Outlays for production-related projects in the 1984-86 survey represent 94% of Canadian spending, up from 88% last year. Environmental spending in the current period is $271.6 million, or 6% of total expenditures. Of total environmental spending, $132.4 million is for water quality projects, $132.4 million for air quality projects, and $6.7 million for solid waste disposal.

SUMMARY OF CANADIAN PROJECTS— REPORTED EXPENDITURES 1984-86[1] BY PROVINCES (C$000)

PROVINCE	PRODUCTION	ENVIRON-MENTAL	TOTAL
Alberta	C$ 101,150	C$22,150	**C$ 123,300**
British Columbia	484,554	36,035	**520,589**
Manitoba	43,200	135	**43,335**
New Brunswick	250,784	34,450	**285,234**
Newfoundland	206,700	—	**206,700**
Nova Scotia	122,822	—	**122,822**
Ontario	837,317	7,700	**845,017**
Quebec	2,234,161	171,135	**2,405,296**
Saskatchewan	14,950	—	**14,950**
Total	**C$4,295,838**	**C$271,805**	**C$4,567,243[2]**

1. Includes projects, as announced, for completion in 1987 and later.
2. Dollar total includes an estimated C$697,481,000 for projects to be completed in 1986 and after (C$689,581,000 production; C$27,900,000 environmental).

TOP SPENDERS IN CANADA

Companies which report capital spending plans of C$100,000,000 or more, including both production and environmental programs

	1983-85	1982-84
Domtar	C$1,021,014,000*	C$166,500,000
Abitibi-Price	272,150,000*	299,250,000
Boise Cascade Canada	261,800,000	n.a.
Reed	260,000,000	120,000,000
Kruger	237,000,000	n.a.
Western Pulp	229,200,000	248,000,000
James Maclaren	224,000,000	255,271,000
Repap Enterprises	223,000,000	n.a.
Consolidated Bathurst	203,000,000*	543,961,000*
Tembec Forest Products	174,700,000*	43,225,000*
E.B. Eddy Forest Products	141,690,000*	320,900,000*
Donohue	131,152,000	31,000,000
Makin Pulp & Paper	115,000,000	—
Ontario Paper Co.	114,891,000	144,891,000*
CIP	102,000,000	211,100,000
Great Lakes Forest Products	101,400,000	383,700,000

*Includes programs for completion beyond 3-year period indicated. Total cost of multiyear project is assigned to year of startup.

NEW PAPER MACHINES IN CANADA

(metric tons)

UNDER CONSTRUCTION OR STARTED UP IN 1984	STARTUP
Great Lakes Forest Products, Dryden, Ont. 122,000-tpy, 194-in., 3,000-fpm Valmet—fine paper	1984
James Maclaren Industries, Masson, Que. 170,000-tpy, 330-in.-trim, 4,500-fpm Beloit—newsprint	1985
Scott Paper, New Westminster, B.C. 36,000-tpy, 180-in.-trim, 5,500-fpm KMW—sanitary tissue	1984

ANNOUNCED, WITH STARTUP DATE

Domtar Inc., Trenton, Ont. 176-in.-trim, 350-tpd, to add 30,000 tpy—semichemical medium	1986
Domtar Inc., Windsor, Que. Two machines, one in 1986, one in 1989—uncoated free sheet	1986-89
Makin Pulp & Paper, Drayton Valley, Alta. 150,000-tpy, from Allimand/Valmet of France—groundwood	1986
Repap Enterprises, Newcastle, N.B. 170,000-tpy, with off-machine coater—groundwood	1986

PROPOSED (NO DATE)

Abitibi-Price, Iroquois Falls, Ont., Grand Falls, Nfld., Alma, Que.
Proposed twin-wire machines, indefinitely postponed—newsprint
Great Lakes Forest Products, Dryden, Ont.
Possible 175,000-tpy machine—newsprint
Kruger Inc., Trois Rivières, Que.
Proposed 172,000-tpy No. 10 Beloit unit (in storage)—newsprint

GREENFIELD MILLS— PROJECTS IN CANADA

(metric tons)

ANNOUNCED, WITH STARTUP DATE

Makin Pulp & Paper, Drayton Valley, Alta. 150-tpd CMP/groundwood mill, with coating plant at nearby Red Deer	1986
Repap Enterprises, Newcastle, N.B. 170,000-tpy lightweight coated mill, with pulp supplied from nearby Nelson-Miramichi and Newcastle pulp mills	1986
Tembec Pulp, Temiscaming, Que. 98,000-tpy bleached CTMP pulp	1987

PROPOSED (NO DATE)

Atco Ltd., Rocky Mountain House, Alta.
Proposed Brazeau Timber Area fine paper mill
Consolidated-Bathurst, Matane, Que.
180,000-tpy CTMP mill being studied
Doman Industries, Nanaimo, B.C.
Proposed 500-tpd TMP mill, possibly to include newsprint machine, on indefinite hold
Prince Albert Pulp, Prince Albert, Sask.
Proposed newsprint mill or aspen pulp mill
Rexfor, Matane, Que.
Proposed 160,000-tpy newsprint or lightweight coated mill

NEW MILLS AND MACHINES ANNOUNCED. After a hiatus of several years, three new greenfield mill projects with firm startup dates were announced in 1984. Makin Pulp & Paper announced plans to construct a 150-tpd groundwood paper mill at Drayton Valley, Alta. Associated with the Drayton Valley mill will be a coating plant in Red Deer, Alta. Startup is scheduled for 1986. Repap Enterprises announced plans to build a 170,000-tpy lightweight coated paper mill at Newcastle, N.B. The mill is to be supplied with slush pulp via pipeline from nearby Repap mills in Newcastle and Nelson-Miramichi. Startup is set for 1986. Tembec Pulp & Co. Limited Partnership will build a 98,000-tpy bleached chemi-thermomechanical market pulp mill at Temiscaming, Que. That mill is scheduled to come online in 1987.

The Makin mill is located in the Brazeau Timber Development Area, which has been the focus over the past several years of most of the greenfield mill proposals in Canada. One proposal still under consideration is for a fine paper mill at Rocky Mountain House, to be built by Atco Ltd. Other greenfield proposals have focused on the Matane, Que., area. Consolidated-Bathurst Inc. has studied a 180,000-tpy CTMP mill for Matane, while the Quebec government agency Rexfor has proposed a 160,000-tpy newsprint or lightweight coated paper mill for the area.

Two new paper machines started up in Canada in 1984. Great Lakes Forest Products brought onstream a 122,000-tpy fine paper unit at Dryden, Ont., early in the year. And Scott Paper Ltd. started up a 36,000-tpy sanitary tissue machine at its New Westminster, B.C., mill in April 1984. Five additional paper machines have been announced with startup dates, four in 1986 and one in 1989. Domtar Inc. will bring online a semichemical medium machine at the Trenton, Ont., mill in 1986, adding 30,000 tpy to mill capacity. In addition, Domtar will install two new uncoated free-sheet machines at the Windsor, Que., mill. The first is scheduled to come onstream in 1986, followed by the second in 1989.

Makin Pulp & Paper plans to start up a 150,000-tpy groundwood unit at the new Drayton Valley mill in 1986, and Repap's 170,000-tpy groundwood machine is also scheduled for 1986 startup. ■

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN CANADA

(over C$50,000,000 at an existing mill site)

Abitibi-Price, Alma, Que.	C$57,100,000
Abitibi-Price, Jonquiere, Que.	77,000,000
Boise Cascade Canada, Fort Frances, Ont.	51,300,000
Boise Cascade Canada, Kenora, Ont.	210,500,000
Bowater Mersey, Liverpool, N.S.	71,000,000
Consolidated-Bathurst, Ville de La Baie, Que	61,100,000†
Domtar, Cornwall, Ont.	87,100,000†
Domtar, Donnacona, Que.	56,160,000
Domtar, Windsor, Que.	773,000,000*†
Donohue, Clermont, Que.	131,152,000
E.B. Eddy Forest Products, Espanola, Ont.	100,842,000†
Great Lakes Forest Products, Dryden, Ont.	95,800,000*
James Maclaren Industries, Masson, Que.	148,000,000*
James Maclaren Industries, Thurso, Que.	76,000,000
James River-Marathon, Marathon, Ont.	95,000,000
Kruger, Corner Brook, Nfld.	167,000,000†
Kruger, Trois Rivieres, Que.	70,000,000
Ontario Paper, Baie Comeau, Que.	86,587,000
Reed, Quebec City, Que.	260,000,000
Scott Paper Ltd., New Westminster, B.C.	63,000,000*
Tembec Forest Products, Temiscaming, Que.	66,700,000†
Western Pulp, Squamish, B.C.	214,000,000

*Includes new paper machine (also in listing of New Machines).
†Includes projects for completion in 1987 and later.
Data in this table necessarily omits expansion projects for which cost information has not been released.

CANADA—REPORTED CAPITAL EXPENDITURES FOR 1984-86+[1] BY REGIONS AND BY TYPE OF FACILITY (C$000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
Maritimes	$ 24,845	23%	$ 81,789	8%	$ 50,000	10%	$ 246,750	21%	$ 96,236	37%	$ 80,686	7%
Quebec	33,665	31%	403,410	37%	248,000	52%	653,042	56%	84,114	32%	811,930	68%
Ontario	41,725	38%	222,117	20%	118,000	25%	207,842	18%	47,255	18%	200,378	17%
Central	—	0%	36,100	3%	—	0%	13,200	1%	5,400	2%	3,450	0%
West	8,798	8%	354,047	32%	60,000	13%	38,410	4%	29,839	11%	94,610	8%
Total	**$ 109,033**		**$1,097,463**		**$ 476,000**		**$1,159,244**		**$ 262,844**		**$1,191,054**	

ENVIRONMENTAL QUALITY SPENDING / TOTALS:

	WATER		AIR		WASTE/UNSPEC.		PRODUCTION		ENVIRONMENT		GRAND TOTAL	
Maritimes	$ 17,725	13%	$ 16,725	13%	—	0%	$ 580,306	13%	$ 34,450	13%	$ 614,756	13%
Quebec	72,110	55%	96,300	73%	2 725	40%	2,234,161	52%	171,135	63%	2,405,296	53%
Ontario	4,050	3%	1,250	1%	2,400	36%	837,317	20%	7,700	3%	845,017	19%
Central	—	0%	135	0%	—	0%	58,150	1%	135	0%	58,285	1%
West	38,525	29%	18,055	13%	1,605	24%	585,704	14%	58,185	21%	643,889	14%
Total	**$ 132,410**		**$ 132,465**		**$ 6,730**		**$4,295,638**		**$ 271,690**		**$4,567,243[2]**	

1. Includes projects, as announced, for completion in 1987 and later.
2. Dollar total includes estimated C$697,481,000 for projects to be completed in 1987 and after ($669,581,000 production; $27,900,000 environmental).

Note: Tabulations are based on these regional divisions: "Maritimes" is New Brunswick, Newfoundland, and Nova Scotia; "Central" is Manitoba and Saskatchewan; "West" is British Columbia and Alberta; Ontario and Quebec are treated individually.

U.S. paper industry to lift capacity by 1.6%/year over next three years

1984 capacity addition plans were revised upward by API in its most recent survey, adding 784,000 tons to its year-earlier projections

By WILLARD E. MIES, Executive News Editor

■ Mills found ways to raise capacity by more than they had been expecting in 1984, leading American Paper Institute (API) to increase its estimate of 1984 capacity by 784,000 short tons from what had been anticipated a year ago. Due to similar causes, 1983 capacity was 312,000 tons higher than had been expected in 1982.

These were among the results published in the association's annual capacity survey, released in late November. Senior vice president Norma Pace also reported that API now expects capacity to rise at a 1.6%/year rate in the next three years (1985-87), reaching 76.3 million tpy at that time, compared with a 1.5% annual growth rate projected in 1983's survey for the 1984-86 period.

Printing and writing papers are in the forefront of capacity expansion in the survey as they were the major reason for the upward revision in the 1984 capacity number. Producers are hoping the same robust market conditions that led them to search for new capacity in the last two years will justify their decision to add capacity at a 3.6%/year rate in the 1985-87 period—a more rapid pace than the 3.4%/year printing/writing capacity growth rate of the 1975-84 period and more than twice the expected 1985-87 rate for the entire paper industry.

Revised 1984 capacity. When mills told API in 1983 what they expected their 1984 capacity to be, printing/writing mills gave a figure that was 921,000 tons lower than API now estimates for 1984. Business has been so good that mills have worked very hard to get increments of production from the system. The bulk of the difference was in coated paper and uncoated free sheet, where capacity turns out to be 320,000 tons and 529,000 tons higher, respectively, than previously projected.

In addition to startup of some new machines, API believes the industry will shut down 39 machines in the five-year 1983-87 period, including 15 complete mill closures. This removes 1.4 million tpy from the survey, although 371,000 further tons represent machines that could be reactivated. Leading the total is the packaging

TABLE 1: **Growth trends in U.S. pulp and paper capacity.**

	Additions 1975-84		Additions 1985-87	
	10-year	Average annual growth (%)	3-year	Average annual growth (%)
Total paper and paperboard	**13,222**	**2.0**	**3,568**	**1.6**
Total paper	8,319	2.6	2,283	2.0
Newsprint	2,215	1.7	(55)	(0.3)
Printing/writing	5,642	3.4	2,183	3.6
Packaging and industrial converting	(369)	(0.6)	(222)	(1.3)
Tissue	921	2.0	377	2.3
Total paperboard	4,903	1.5	1,285	1.2
Unbleached kraft	3,825	2.5	572	1.1
Solid bleached	266	0.7	252	2.0
Semichemical	789	2.2	174	1.1
Recycled	22	—	287	1.1
Total woodpulp	**10,002**	**1.9**	**2,460**	**1.4**
Dissolving and special alpha	(320)	(1.9)	—	—
Sulfite	(675)	(3.2)	(2)	—
Sulfate and soda*	8,678	2.3	2,186	1.7
Semichemical	336	0.8	85	0.6
Mechanical	1,982	4.0	191	1.0

*Includes screenings. ( ) =Decline.

TABLE 2: **Regional distribution share of U.S. capacity changes, 1984-87 (%).**

	Northeast	Central	South	West
Total paper and paperboard	**10.8**	**17.1**	**63.3**	**8.8**
Newsprint	—	—	—	—
Printing/writing	12.2	20.9	58.0	8.9
Tissue	28.6	15.0	57.1	(0.7)
Unbleached kraft paperboard	—	—	88.7	11.3
Semichemical paperboard	0.4	27.5	58.1	14.0
Total woodpulp	**1.4**	**15.1**	**75.4**	**8.1**
Sulfate and soda	1.2	13.9	76.1	8.8
Semichemical	1.4	20.1	79.7	(1.2)
Mechanical	2.5	21.5	69.3	6.7

( ) =Loss.

and industrial converting group, with five machines expected to be shut down, representing 372,000 tpy of capacity. After the survey was completed, International Paper Co. announced permanent closure of its 255,000-tpy Camden, Ark., kraft paper mill.

The South continues to dominate the news in the area of capacity growth: with 52% of total paper and board capacity in 1983, it will claim 63.3% of capacity expansion in the 1984-87 period. All other regions of the country show a smaller share of future expenditures than their present share of capacity.

Another significant trend is the gradual increase of recyclable paper and primary fibers as a percentage of total fiber requirements, while "woodpulp produced from manufacturing and forest residues is expected to decline from 31.2% to 29.9% of total fiber consumed," according to the survey. Recyclable paper should rise from 23.2% to 24.2% of total fiber needs; primary woodpulp will climb from 44.9% to 45.3%. A record 72.4 million tons of woodpulp, recyclable paper and other raw materials were consumed in 1984, while capacity requirements by 1987 would bring total consumption to 77.2 million tons.

Newsprint. The U.S. industry's rapid newsprint capacity expansion is over. Capacity will fall by 55,000 tons by 1987 due to shutdown of one machine in 1984 and two more in 1985, which alone will remove more than 300,000 tons from capacity totals.

Printing and writing paper. At least seven new machines are planned for the next three years, which, with other additions, will increase capacity by 2.2 million tons. If all the planned expansions are implemented, capacity will reach nearly 22 million tpy, or 29% of all paper and board capacity.

Tissue. Capacity expansions for tissue papers, including sanitary and industrial grades, will average 2.3%/year in the three-year 1985-87 period, reaching 5.6 million tons. This growth rate compares with the 2%/year rate of the period from 1974 to 1984, and "confirms the more aggressive plans of tissue paper producers that were reported in 1983's survey," according to API.

Packaging papers. During the past decade, capacity for unbleached kraft packaging papers fell by 435,000 tons. These losses have mainly reflected increased competition from alternative packaging materials, pressuring producers to switch machines to other grades or shut down marginal properties. These trends will continue.

Kraft linerboard and semichemical paperboard. Only one new liner machine and no semichemical machines are scheduled for startup after 1984, so that growth in containerboard capacity is expected to average little more than 1% annually. However, a number of expansion projects have been under study and some additional kraft paper capacity could be shifted to linerboard.

Solid bleached paperboard. After a ten-year period of low growth—averaging just 0.7%/year—this industry is now planning expansions averaging 2%/year, bringing on 252,000 tons of new capacity.

Recycled paperboard. Restructuring of the recycled board industry has been the rule for many years now, with more than 100 machines and over 3 million tons of capacity being idled permanently between 1970 and 1984. Over the next three years, however, a different picture should emerge: a new machine is scheduled to start up, and new expansions industry-wide should add 287,000 tons of capacity over the three-year period.

Sulfate and soda pulps. A greenfield pulp mill and other major expansions are expected to increase capacity by 1.7%/year, totaling 2.2 million tons of new capacity. All expansions will be in bleached and semibleached kraft, which will expand in capacity by 10% and boost their share of sulfate pulps from 51.1% in 1984 to 53.6% in 1987. Unbleached pulps will lose share and also show an absolute drop in capacity.

Market pulp. Market pulp capacity will rise from 5.7 million tons in 1984 to 6.2 million tons in 1987. This 2.8%/year rate compares with the 1.7%/year rate of all sulfate pulps and continues a decade-long expansion which has raised U.S. market pulp capacity by more than 60%. ■

TABLE 3: **Paper and paperboard annual capacity, 1984-87 (000 tons).**

	1984	1985	1986	1987
Total paper and paperboard	**72,729**	**73,700**	**74,973**	**76,317**
Total paper	**36,851**	**37,297**	**38,100**	**39,134**
Newsprint	5,847	5,758	5,765	5,792
Printing/writing	19,770	20,462	21,087	21,953
Uncoated groundwood	1,693	1,710	1,712	1,713
Coated groundwood	3,701	3,744	3,863	4,262
Coated free sheet	2,704	2,849	2,959	3,069
Uncoated free sheet	10,083	10.559	10,915	11,266
Cotton fiber	176	180	180	181
Thin papers	338	338	338	338
Solid bleached bristols	1,075	1,082	1,119	1,126
Packaging and industrial converting	5,991	5,755	5,754	5,769
Unbleached kraft	3,954	3,704	3,700	3,705
Bleached packaging and industrial converting	566	571	556	556
Specialty packaging	551	554	563	565
Special industrial	919	926	934	942
Tissue	5,243	5,322	5,494	5,620
Total paperboard	**35,898**	**36,403**	**36,874**	**37,183**
Unbleached kraft	17,790	18,027	18,214	18,362
Kraft linerboard	16,488	16,723	16,914	17,052
Solid bleached	4,187	4,321	4,354	4,439
Semichemical	5,219	5,299	5,350	5,393
Recycled	8,702	8,756	8,956	8,989
Total construction paper and board and other	**2,877**	**2,863**	**2,864**	**2,864**

TABLE 4: **Woodpulp annual capacity, 1984-87 (000 tons).**

	1984	1985	1986	1987
Total all grades woodpulp	**58,461**	**59,069**	**60,237**	**60,868**
Total woodpulp*	**57,139**	**57,800**	**58,968**	**59,599**
Dissolving	1,504	1,504	1,504	1,504
Chemical paper grades	44,980	45,650	46,721	47,165
Sulfite paper grades	1,726	1,718	1,722	1,724
Sulfate and soda paper grades	43,255	43,932	44,999	45,441
Bleached and semibleached softwood	12,429	12,954	13,339	13,518
Bleached and semibleached hardwood	9,663	10,105	10,671	10,823
Unbleached	21,163	20,873	20,989	21,100
Semichemical	4,569	4,609	4,624	4,654
Mechanical	6,054	6,005	6,088	6,245
Screenings	31	31	31	31
Total woodpulp for construction paper and board	**1,322**	**1,269**	**1,269**	**1,269**

*Excludes pulp for construction paper and board.

1984 saw budworm population fall, but 13-year infestation isn't over yet

Northeastern pulp and paper industry faces serious shortfall by the year 2000 unless forest management is intensified; in some areas it's too late

By NANCY J. LARSEN, Staff Editor

■ Eastern North America's 13-year battle with the spruce budworm rages on. At stake are the balsam fir and spruce forests, a prize the region's pulp and paper industry cannot afford to surrender. It has been a costly fight and it is not yet over, although 1984 brought some relief to the beleaguered forests as the population of insurgent insects underwent a general decline.

Most forest management experts agree that this respite does not indicate an end to the war, and unless long-range programs of forest management are intensified in combination with continued protection, a shortfall in the supply of balsam/spruce will affect the pulp and paper industry within the next 20 to 50 years.

The current epidemic, unprecedented in both intensity and size, is the third major infestation this century. In spite of ongoing investigation into the causes of these cyclical swells in the eastern spruce budworm population, conclusive answers have not yet been found.

Traditional theory proposes that budworm epidemics begin in the forests of western Ontario and move eastward. A more recent theory postulates that incipient epidemics incubate in mixed-wood forests with large numbers of white spruce and hardwood. From this epicenter, huge numbers of insects radiate to softwood forests, where, like Sherman through Georgia, they defoliate and destroy.

It is widely believed that the budworm reaches epidemic proportions when climatic conditions—several years of warm dry spring weather—coincide with the existence of an adequate food supply—large numbers of mature fir/spruce trees. The present outbreak seems to support several of these suppositions. The outbreak began in the late 1960s in the forests of Ontario, Quebec and central New Brunswick. At that time, eastern North American forests were even-aged and dominated by mature and over-mature balsam and spruce, regenerated after the last major infestation in the early 1900s.

Thus the record number of insects, coinciding with an unprecedented abundance of food, has produced the severest budworm infestation yet witnessed—so severe that areas such as Nova Scotia and Newfoundland, relatively untouched by past outbreaks, have sustained unparalleled damage.

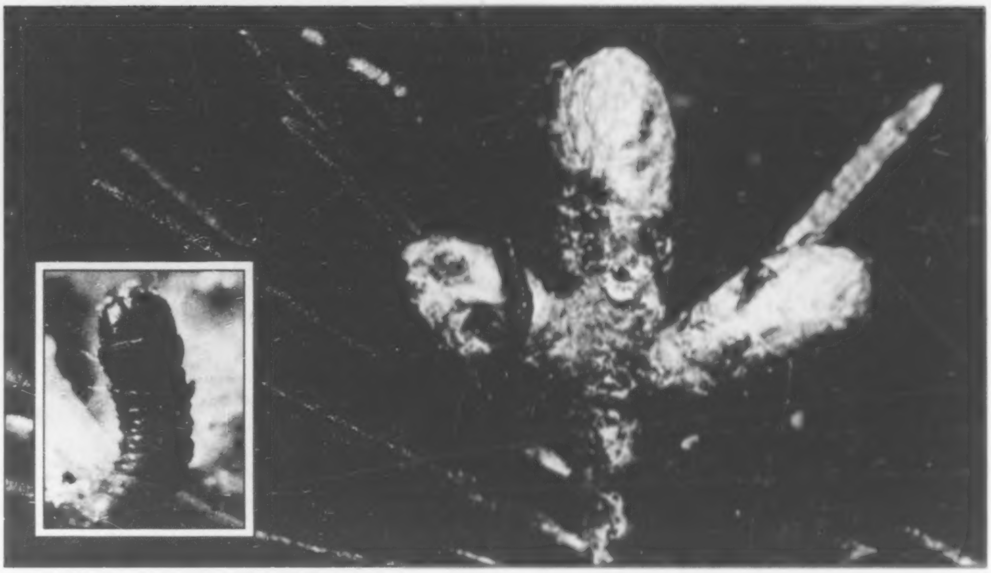
DAMAGE REPORT. According to one Canadian forestry expert, "If one were to get on a plane and fly over the forests of northeastern Canada, one could fly for five hours and see nothing but damaged trees, dead trees, dying trees."

Losses of prime softwood sustained by the Canadian and American paper industry in some regions range from severe to catastrophic. They are as follows:

- Maine—3 to 5 million cords of prime softwood, or $100 million worth of timber, has been destroyed
- Ontario—100 million m³ of primarily balsam fir killed
- Quebec—losses totaling 91 million m³ of pulpwood through 1983 are expected to increase to 161 million m³ by 1986. This lost volume would represent enough wood to keep all the mills in the Thunder Bay region of neighboring Ontario operating for about 30 years
- New Brunswick—in 1983, 2.2 million m³ of balsam fir and 1.7 million m³ of spruce were lost
- Newfoundland—20 to 28 million m³ of wood lost to the budworm
- Nova Scotia—loss sustained by the pulp and paper industry to date is quoted at C$2 billion of pulpwood. Cape Breton's highlands have lost 24 million m³ of wood, or a ten-year supply to the Port Hawkesbury mill.

1984'S DOWNWARD TREND. Much of the budworm-besieged region saw a decline in the insect's numbers in 1984. In 1983, northwestern and southeastern portions of Maine's fir/spruce range experienced high levels of budworm infestation. Current reports indicate that 1983's figure of 4.0 million acres of moderately to severely infested fir/spruce forest will have declined to 3.0 million acres in 1984.

According to Thomas Rumpf, forest insect manager with Maine's Dept. of Conservation, there is no clear indication as to why the trend is downward, but declines have occurred in the past. "It's not a collapse of the population or anything, it's more a fluctuation in popula-



AT RIGHT: **Called "the bug that is eating eastern North America,"** ***Choistoneura fumiferana*****, or eastern spruce budworm, will feast on red spruce, white spruce and black spruce, preferring treetops and branch tips.** *INSET:* **A close-up picture of the budworm larva is shown.**

tion, a natural fluctuation."

New Brunswick is also witnessing a general reduction in the infestation's scope and intensity. The budworm epidemic dropped by approximately one-fifth in 1983 as large continuous areas of infestation broke up into smaller patches. Surveys indicate that 10 million acres of forestland were expected to remain moderately to severely infested in 1984, however.

Early in 1984, Newfoundland's forestry minister Charlie Power announced that the infestation was at a manageable stage, while a spokesman for Newfoundland's Dept. of Forest Resources countered that although insect populations have declined since the late 1970s, "the budworm is such a dynamic pest, we still consider it to be a threat."

1983 brought a surge in budworm numbers for Nova Scotia's western and northern mainland counties, as well as portions of the Cape Breton highlands. For 1984, however, budworm-inflicted damage was expected to drop by half. However, Ken Streatch, Forest Minister, warns that the threat posed by the insect will hang over the forests "like Damocles' sword" for decades.

For Quebec, 1984 marked the first decline in budworm numbers since 1980. In 1983, the area of infestation increased by 8 million acres to a total of over 32 million acres.

Ontario will not share in 1984's respite. According to Gordon House of the Great Lakes Forest Research Station in Ontario, "We have several outbreaks within the province, which we follow separately . . . . What we are seeing is changes within those regional outbreaks, and this affects the overall totals for the province. Thus we are seeing some increases in northwestern Ontario, a doubling or tripling of the extent of infestation each year, in recent years. And we are looking at a further increase next year."

Characterizing the whole outbreak, Dr. House reported, "My impression is that things do seem to be declining somewhat in the eastern part of Canada, in a very general sense. But there will be exceptions to that. By and large, there seems to be a pattern of decline in eastern Canada, essentially from northeastern Ontario to the East."

DESTRUCTIVE DEFOLIATOR. Armed with only a voracious appetite and a fondness for balsam fir or spruce, an innocuous-looking brown caterpillar barely an inch long has proven to be the pulp and paper industry's arch enemy. Called "the bug that is eating eastern North America," *Choistoneura fumiferana*, or eastern spruce budworm, is indigenous to the northern spruce/fir forests of Canada and the U.S.

The spruce budworm preferentially attacks balsam fir, but lacking that, will feast on red spruce, white spruce and black spruce, in declining order of choice. If unchecked, infested trees are progressively defoliated until they die, with balsam fir the least able to withstand budworm feeding.

The *fumiferana* has a one-year life cycle, with adult moths emerging from the pupal stage at the end of July, mating, laying eggs and dying within 14 days. Eggs are deposited on the underside of needles and hatch in two weeks. The newly emerged larvae find shelter on the tree (under bark scales and in flower and needle scars), spin a silky web cover, and hibernate over the winter.

Spring marks the reappearance of rapacious larvae, who feed on fresh needles, flowers and buds. Preferring treetops and branch tips, larvae will feed upon old foliage in extreme infestations. From late June to mid-July, larvae enter the pupal stage and prepare to start the cycle once again.

Natural predators, weather and food supply all affect larval growth and insect mortality, and under ordinary conditions keep the number of larvae below one per 18-in. branch tip.

When the larval count exceeds one to two larvae per 18-in. tip, most regions consider the number potentially serious enough to implement natural control with spraying. If the count grows to 10 to 15 larvae per 18-in. tip, all new foliage will be consumed. Surveys taken at the height of this current outbreak counted 50 to 100 larvae per 18-in. branch tip in many areas.

CHEMICAL WARFARE. To date, spraying of chemical insecticides remains the single most effective, least costly method of protection of the forest against the rampaging budworm. However, chemical spraying is controversial, facing highly visible and increasingly militant opposition. Exemplifying the impact this emotional debate has already had on forest industry practices, a group of private citizens—citing the inherent danger spraying could pose to human health—successfully sued earlier this year to halt application of herbicides on national forestland in Oregon and Washington. Citizen opposition has prevented Nova Scotia for years from employing the kind of massive spraying program relied on by neighboring New Brunswick.

Caught on the horns of a dilemma, those states and provinces facing the budworm must choose either to spray in an effort to contain loss of invaluable wood resources—and face mounting public opposition—or to discontinue protective spraying and allow wide-scale tree mortality. A cohesive and unifying plan of action has not been found, and protection programs vary from province to province, state to state.

Maine and New Brunswick have perhaps the most aggressive spraying policies; New Brunswick spends approximately C$14 million dollars per year on protective spraying. Other regions, like Quebec and Ontario, have adopted a more conservative spraying program, concentrating protection on selected areas while abandoning others. Ontario, for instance, focuses on protection of commercial forests, seed production areas, parks, plantations and animal habitats. At the other end of the spectrum from Maine and New Brunswick is Nova Scotia, which, following a policy instituted in the mid-1970s, prohibits the use of all chemical insecticides.

Most forest managers, while aware of the need to keep spray programs at minimum levels due to health risks, concur with a CIP Inc. spokesman who said, "Though spraying is not 100% effective, there is ample evidence to confirm that spraying can protect trees."

Another industry spokesman from Quebec, critical of his province's spraying program, said, "We haven't been able to protect our forest; we lost it . . . we sprayed for five years (and stopped). If we had sprayed for another three to four years, we really probably would have protected it. With areas that we continued to spray for the four years, we can prove the spraying operation was effective . . . but unfortunately, it wasn't enough."

With ever-mounting claims and counterclaims surrounding the issue of protective spraying, the need for viable alternatives clearly increases.

POSSIBLE SOLUTIONS. *Bacillus thuringiensis* (BT) may provide the solution to the controversy surrounding chemical spraying. BT is a bacterium that, when ingested by the budworm larva, paralyzes its stomach and kills it. Described as a safe alternative to chemical spraying, this organic substance does not have any adverse effect on plants, animals, or humans. As BT wins approval from opponents of chemical spraying, it is also making inroads into spraying programs throughout eastern North America. Once only erratically effective and more than six times as expensive as chemical insecticides, BT has rapidly improved in both efficacy and cost.

TABLE 1: **Budworm infestation levels—moderate to severe (000 acres).**

Region	1983	1984
Maine	4,000	n.a.[1]
New Brunswick	5,000	n.a.[1]
Newfoundland	247.1	154.0
Nova Scotia	726.5	617.8
Ontario	22,500	30,000
Quebec	32,000	n.a.

[1] n.a. — Not available, but trend is downward.

In spite of application limitations and slightly higher cost, Maine will increase use of BT from 15% to 20% of its total spraying program. Quebec planned to spray 1.9 million acres in 1984, utilizing BT on approximately 741,000 acres, which represents an increase of over six times the area treated with BT in 1983. New Brunswick increased total area treated with BT from 20,000 acres in 1983 to 75,000 acres in 1984. Ontario's current protection program utilizes BT almost exclusively, while Nova Scotia, using only BT, will spray about 70,000 acres.

OTHER VIABLE ALTERNATIVES. Research into other environmentally safe alternatives to protective spraying continues. While experiments conducted with sex pheromones, the chemical emitted by the female moth during the mating season to attract the male, have proven unsuccessful as a means of budworm control, work in this area indicates that manipulation of this behavioral mechanism can effectively serve as a monitoring aid. Pheromone traps offer an improved alternative to current survey methods of egg mass and larval counts, and according to one forestry expert, "a better tool in the future to keep track of the beast."

Physiological control—disruption of the budworm's natural growth cycle—is also being explored, but while research continues, results have been inconclusive.

Experimentation with biological control is also underway. In Ontario a small wasp, the *trichogramma minutum*, a natural predator of the spruce budworm, has been released in numbers exceeding one-half million per acre in the hope that the insect, which kills budworm egg masses, will bring about a sizable decline in future budworm populations. The future may provide the forest manager with a number of available options for control of the budworm. However, the war against the budworm must be waged on two fronts.

GREEN WOODS MODEL. "Protection is effective in delaying, although not preventing, the wood shortfall," according to Thomas Rumpf, forestry insect manager with Maine's Dept. of Conservation. Past studies have shown that budworm outbreaks are related to age and class distribution and past forest management. Reflecting the opinion of most forestry experts, Rumpf stated that if effects of the anticipated shortfall are to be mitigated, "concerted action must be undertaken now, not only to maintain protection programs but also to ensure the future existence of a healthy, vigorous forest, a forest less vulnerable to the budworm." In order to generate a continuous yield from this resource, the forests have to be meticulously managed and regenerated, said Rumpf.

The Maine forest service, wanting to implement the most efficient forest management strategy, contracted James Sewall Co. to analyze Maine's future supply of spruce and fir. The analysis considered a number of variables, such as different methods of protection, management and harvesting practices. Results from this analysis, called the Green Woods Model, are applicable to all of eastern North America.

The study focused on two general questions: could current harvest levels be sustained, based on existing harvesting and management levels; and if a shortfall does occur, what would be its magnitude, when might it occur, and what mitigating actions might be undertaken? Using a computer model, empirical data was combined with various selected variables.

Results confirmed that a wood shortfall will occur early in the twenty-first century if Maine's harvesting levels (2.8 million cords/year) and protection program (20% of total spruce/fir inventory) remain constant.

Suggested means for extending the life of the old forest by keeping the existing spruce alive include increased spraying, commercial thinning in high-volume spruce stands, and concentrated cutting of budworm-damaged trees. Maintenance of current harvest levels would then be possible until the year 2000. After the year 2000, it is suggested that Maine's pulp and paper industry reduce harvesting by 25%. This reduction might be offset by innovative technology, such as wholetree utilization and use of alternate species.

This new forest should be less budworm-vulnerable. Inherent in this statement are the following requirements, according to the Green Woods approach: the new forest should have an improved age class structure and have a composition favoring black spruce, which is least vulnerable to budworm attack.

Recent reports from Newfoundland indicate, however, that large stands of black spruce have died after a spruce budworm attack. Initial studies conducted by the provincial government indicate that many of these stands now support significant numbers of secondary pests, which attack weakened or severely defoliated trees. It is suspected that the feeding damage to the black spruce by the spruce budworm has so weakened the trees that they are vulnerable to secondary insects.

Despite the alarming possibilities this report conjures, most foresters feel that this single incident does not detract from the potential that black spruce evidences as a way of regenerating a forest in which the pulp and paper industry can minimize direct competition with the budworm. Present replanting programs in most regions are using black spruce almost exclusively.

Concluding on an optimistic note, the Green Woods Model asserts that if the new forest can come to harvestable size at younger ages, land accessible to harvest will increase, and forests will require less protection.

No one is willing to predict when the budworm epidemic will end. Nor can anyone guess how much longer the besieged forests can survive. What effect the looming shortfall will have on the war-weary pulp and paper industry remains unanswered.

Only one prediction is made without hesitation by all experts: the future will bring new budworm infestations. As one pulp and paper executive asked, "Are we going to be ready next time? Are we going to have the willingness to do things we haven't been willing to do this time? The time for action is when the forest is free of budworms, that is the time for extremely intensive work to be carried on . . . but when there isn't a problem, people aren't interested in spending money on it. But that is precisely the time when we should be increasing our efforts." ■

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TiO_2 demand continues to rise as imports hold steady

By BARRY SHOCKETT

Although TiO_2 imports had reached 122,000 tons by the end of July (210,000 tons annualized), the monthly rate was expected to decline for the last five months of 1984. On the other hand, exports in 1984 should have continued to increase to 104,000 tons, 61,000 tons having left the country in the January to July period. Based on seven-month statistics, production was running 9% ahead of the comparable 1983 period. Total 1984 output was probably about 7.5% greater than 1983. Combined shipments from Canadian and European sources made up 21% of total demand in 1983 but could drop off slightly in 1984 to about 20%.

U.S. statistics, titanium dioxide (000 short tons)

	1981	1982	1983	1984e
Capacity	1,005	950	905	909
Production	750.5	650	757.5	814
Imports	125	139	175	175
Exports	61	68	93.5	104
Apparent consumption	814.5	721	839	885

Source: Bureau of Census, U.S. Dept. of Commerce. e = Estimated.

Canadian statistics, titanium dioxide (000 short tons)

	1981	1982	1983	1984e
Capacity (nameplate)	82.7	82.7	82.7	88.2
Production	78.8	79.4	82.7	86
Imports	7.8	6.4	16	17.5
Exports	15.4	17.6	25.4	28
Apparent consumption	71.2	68.2	73.3	75.5

TITANIUM DIOXIDE

UNITED STATES

Uses: Rutile and anatase grades of TiO_2 are used as fillers and coating pigments by the paper industry in printing/writing papers and paperboard. The largest end-use is in paints (50%), followed by plastics (12%), rubber, ceramics, and other applications.

Demand: In 1983, the paper industry consumed an estimated 197,000 tons of TiO_2—up 14.5% from the previous year—accounting for almost 24% of total TiO_2 demand (839,000 tons). Continued growth of both paper and paperboard should have resulted in overall industry usage increasing to an estimated 216,000 tons in 1984 (up about 9.5%).

Sources: The five U.S. producers, in descending order of capacity, are E.I. DuPont, SCM Corp., NL Industries, Kerr-McGee, and Gulf + Western. At the end of 1984, NL Industries had agreed to acquire American Cyanamid's Savannah, Ga., facility. (NL had closed its plant in Sayreville, N.J., two years ago.) SCM is expanding its Ashtabula, Ohio, plant (acquired in 1983 from G+W) by 22%. Kerr-McGee completed the first phase of its expansion at Hamilton, Miss., in the third quarter of 1984. The second stage is scheduled to come onstream early in 1985.

Availability: No shortage of TiO_2 is anticipated as about 15,000 tons of new capacity will have come onstream by 1985. 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, anatase, market; rutile, tight.

Pricing: List prices for both anatase and rutile grades are still unchanged from late 1981. However, the 5¢/lb increase on July 1 brought the market price to the posted levels. This was the third boost in 1984 (following a 1.5¢/lb hike in October 1983). The previous increases came in April (3¢/lb) and January (2¢/lb). Pricing history, anatase: 1984, 70¢/lb, delivered; 1983, 70¢/lb; 1982, 70¢/lb; 1981, 58¢-70¢/lb; 1980, 57¢/lb; 1979, 53¢/lb; 1978, 46¢/lb; rutile: 1984, 75¢/lb; 1983, 75¢/lb; 1982, 75¢/lb; 1981, 63¢-75¢/lb; 1980, 57¢/lb; 1979, 59¢/lb; 1978, 52¢/lb.

Forecast: Demand for TiO_2 is expected to continue to improve both domestically and on a worldwide basis. With NL Industries returning to domestic production, imports in 1984 will have probably equaled the 1983 record of 175,000 tons. As the economy continues to improve, a further 5% to 6% price hike could occur this year.

CANADA

Uses: About 90% of the anatase TiO_2 used by the paper industry is employed by fine paper mills, with paperboard applications accounting for the rest. The paint industry is the largest dioxide consumer (55%), followed by plastics (17%), and rubber and miscellaneous uses (14.5%).

Demand: Paper industry usage in 1983 was 9,400 tons, about 1,100 tons more than the previous year. In 1984, mill consumption should have risen about 12% to 10,500 tons—14% of total TiO_2 demand. In 1984, imports were expected to be about 17,500 tons compared with 16,000 tons in 1983.

Sources: The two domestic producers are NL Chem Canada and Tioxide Canada. In 1983, 42% of the imports (22% of total demand) was from the U.S.; the balance came from Europe.

Availability: Despite the high operating rate (close to 98%), any increase in domestic demand could easily be satisfied by reducing exports until new capacity comes onstream. 1984, anatase, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: List prices for untreated anatase, which had been unchanged since January 1982, rose 5¢/lb on Sept. 10. The lists had been discounted by 2¢/lb from the period February to November in 1983. Pricing history: 1984, 80¢ to 85¢/lb, bags, delivered; 1983, 80¢/lb; 1982, 74.5¢-80¢/lb; 1981, 69¢-74.5¢/lb; 1980, 59¢-69¢/lb. (Note: Slurry shipments are 0.5¢/lb extra.)

Forecast: TiO_2 demand by the paper industry should increase 6%/year until 1988; total dioxide consumption grows between 6% and 7% until 1988.

Mr. Shockett, of Corpus Information Services, Don Mills, Ont., is consulting editor, chemical markets, for Pulp & Paper.

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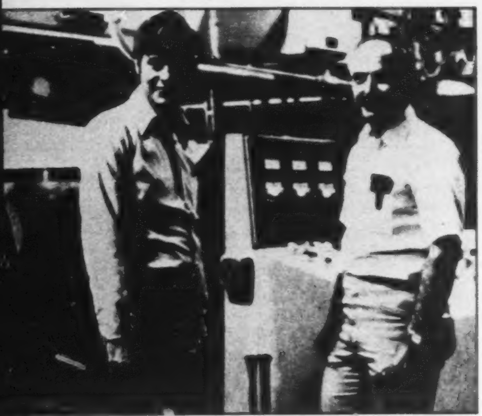

Video monitor at St. Helens mill

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This issue examines two dominant process automation trends: cross-direction control and millwide automation. (Photo courtesy of Crown Zellerbach Corp.)

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Office locations

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SF — San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273
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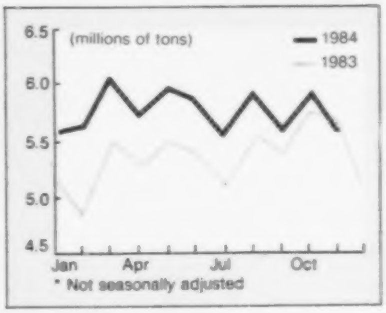
U.S. paper and board production, 1984/83



* Not seasonally adjusted

November production of U.S. paper and paperboard dipped below year-earlier levels for the first time in 1984, dropping 1.6% compared with November 1983, according to the American Paper Institute. Total production for the month was 5.6 million tons, bringing the annualized year-to-date total to 69.4 million tons, up 6.3% from 1983. According to weekly API data through Dec. 29, total 1984 production amounted to some 68.5 million tons, up 5.4% over record 1983 levels. Paper accounts for 34.3 million tons of that total, up 5.6% over 1983, and paperboard 34.2 million tons, up 6.3%.

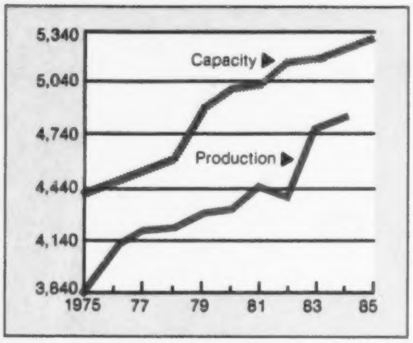
Among major grades, printing and writing papers showed some weakness in November compared with 1983, as did packaging papers, reflecting the fall slowdown in the economy. Containerboard production also declined from November 1983. Bleached board was up a modest 0.3% over 1983, however.

Canadian newsprint shipments in November totaled 770,000 metric tons, a gain of 0.5% over November 1983, said the Canadian Pulp & Paper Assn. Newsprint mill operating rates reached 95% in November, up from 91% in October. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Nov.	460	1.5	5,579	7.5
Uncoated groundwood (s)	Nov.	127	−8.0	1,584	3.1
Coated paper (s)	Nov.	518	−4.1	6,232	9.8
Uncoated free sheet (s)	Nov.	729	−2.1	9,205	5.1
Other printing/writing	Nov.	122	—	1,482	5.2
Total packaging and other paper (s)	Nov.	428	−11.9	5,639	2.4
Tissue	Nov.	400	1.3	4,873	1.5
Total paper	**Nov.**	**2,783**	**−2.1**	**34,595**	**5.3**
Unbleached kraft paperboard	Nov.	1,307	−1.8	16,230	7.0
Semichemical medium	Nov.	411	−2.8	5,204	9.8
Bleached paperboard	Nov.	331	0.3	4,100	3.9
Recycled paperboard	Nov.	639	−0.9	8,075	8.3
Total paperboard	**Nov.**	**2,773**	**−1.1**	**34,779**	**7.3**
Total U.S. paper and paperboard output	**Nov.**	**5,558**	**−1.8**	**69,374**	**6.3**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Oct.	4,798	2.6	56,083	6.7
Market pulp production	Oct.	635	7.6	6,865	5.7
Wastepaper consumption at paper/board mills	Oct.	1,389	5.1	15,947	9.8
Pulpwood consumption (cords)	Oct.	7,625	1.2	88,342	3.1
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Nov.	21.103	0.3	247.627†	6.8
Containerboard inventories at U.S. box plants and mills	Nov. 1	2,602	−3.7		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Oct.	920	10.2	11,140	26.2
Imports of Canadian newsprint	Oct.	634	0.6	7,689†	13.6
U.S. paper exports (including products)	Oct.	359	3.5	4,531	−0.7
Exports of unbleached kraft linerboard	Nov.	112	−29.1	2,018	−12.1
Exports of woodpulp	Oct.	284	−9.8	3,610	—
Norscan pulp inventories[4]	Nov. 30	1,628	−0.1		
Norscan pulp operating rates[4]	Nov.	95%	93%	93%	91%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Nov.	770	0.5	8,261†	7.1
Operating rates		94%	95%	92%	85%
Inventories held by U.S. consumers	Nov. 30	1,376	12.9		
Other paper/board shipments	Nov.	445	2.1	4,813	8.3
Woodpulp shipments (export only)	Nov.	582	11.3	6,118†	0.6
Operating rates	Nov.	95%	91%	87%	86%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1983	1984	1985e
Production[1]	4,789	4,875	4,923
Capacity[1]	5,190	5,243	5,322
Utilization rate	92.3%	93.0%	92.5%
Imports[2]	12	28	25
Exports[2]	16	17	18
Apparent U.S. consumption	4,785	4,886	4,930
lb/capita	41.0	41.5	41.5
GNP ratio	3.11	2.98	2.92

1. American Paper Institute data.
2. Commerce Dept. data.
e = Estimate.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Scott Paper	1,035	19.4
2. Procter & Gamble	900	16.9
3. Fort Howard Paper	620	11.6
4. James River	560	10.5
5. Georgia-Pacific	510	9.6
6. Kimberly-Clark	400	7.5
7. Potlatch	300	5.6
8. Crown Zellerbach	285	5.4
9. APL	95	1.8
10. Wisconsin Tissue	91	1.7

Market share of top five companies: **68.1%**

Market share of top ten companies: **90.1%**

Total U.S. capacity (1985):
5.322 million short tons

Correction. Several errors appeared in the January 1985 Grade Profile for linerboard due to a format change for this page. U.S. industry capacity in 1985 should have been 16.723 million tons, capacity share of the top five producers 39.9%, and share of top ten companies 61.8%.

TISSUE: Healthy market this year; clouds on horizon

Grade structure: Tissue can be grouped into the sanitary sector and "other tissue." Sanitary makes up about 97% of total production. The major sanitary tissue grades are bathroom and facial tissue, towels, napkins and basestock for sanitary stock, wadding, and wipes. "Other tissue" includes basestock for waxing, wrapping, and miscellaneous. Sanitary can be divided into consumer products and commercial/industrial uses. Consumer products make up about two-thirds of sanitary tissue output. Typical basis weights include 12 to 14 lb/3,000 ft² for single-ply bathroom tissue and 32 to 39 lb/3,000 ft² for single-ply towel.

Production/capacity: Tissue producers enjoyed the benefits of economic recovery in 1984 by achieving new production records. This performance was, in fact, unusual for the 1980s—1983-84 was the first time in the decade when the industry put together back-to-back years of increased production (up 8.3% in 1983 and 1.8% in 1984). Generally the tissue industry tracks economic activity, with some moderating effects from population trends, and 1983-84 was no exception.

Production increased by 12.9% between 1980 and 1984, while the number of paper machines in the industry was dropping. Between 1980 and 1982, according to the American Paper Institute, 29 machines were shut down. A total of 264,000 tons of capacity was removed from API lists as a result, and a further 91,000 tons were idled but still listed. API removed a further eight machines, representing 101,000 tons of capacity, from its capacity survey for the 1983-87 period.

Meanwhile, however, new paper machines were installed or announced for the 1983-87 period by Wisconsin Tissue Mills, Fort Howard Paper Co. (two units), James River Corp., and Crown Zellerbach Corp. New machines are expected to produce 332,000 tons of new capacity in 1984-87.

Outlook: The industry seemed likely to continue riding the crest of economic recovery in 1985, but some observers foresee a risk of softness in 1986 due to significant capacity expansions planned, especially if a recession or growth recession occurs. Prices have only just started to rise, and analysts fear the first real increases in three years will be undermined after only a year of consolidation if old machines are not idled in the meantime.

Consumer tissue mills raised quotes by around 5% to 8% for most grades in December 1984, following an attempt in the spring of 1984 to boost prices that was partially undercut by the bane of the '80s: widespread promotional discounting. One factor that may help in 1985, in the view of Smith Barney, Harris Upham & Co. analyst George Adler, is the apparent "180-degree change of strategy on P&G's part," from a seeming "emphasis on market share and volume to an emphasis on profit"—represented by its move away from selective price hikes and toward across-the-board price increases.

Pricing: Price trends tracked by the Bureau of Labor Statistics' producer price index for sanitary papers and health products are as follows (year-end; 1967=100): 1972, 121.5; 1974, 181.1; 1975, 201.7; 1976, 223.5; 1977, 240.7; 1978, 264.3; 1979, 291.0; 1980, 338.8; 1981, 348.4; 1982, 361.0; 1983, 359.7; 1984 (third quarter), 367.4.

Markets: Breakdown of major tissue end-uses is as follows: toilet, 39% (of which 63% is single ply and 37% is multi ply); towels, 32%; facial, 7%; napkins, 12%; wipes, 3%; other sanitary, 3%; nonsanitary, 3%. Nonsanitary tissue shipments have slid from 230,500 tons in 1972 to 106,804 tons in 1982. ■

(News section continues on page 23)

Bowater Newfoundland mill closing on sale set

Sale of Bowater Newfoundland Ltd.'s 272,000-metric-tpy newsprint mill in Corner Brook, Nfld., to Kruger Inc. was expected to go through in December after being delayed for several weeks. A local official said all necessary requirements for transference of ownership had finally been fulfilled. Most recently, an old labor law could have made Kruger liable for an estimated C$6 million in back wages.

Kruger is expected to begin a five-year, $198-million modernization of the mill by April, a company executive said. The provincial and federal governments have agreed to finance 20% of the project. The signing of all documents related to the sale was set for Dec. 21, with Kruger assuming ownership immediately. ■

Boise completes purchase of venture

Boise Cascade Corp. has completed the purchase of substantially all of Sonat Inc.'s interest in their Boise Southern Co. joint venture in a recent transaction which is valued at approximately $200 million (*P&P*, June, p. 25).

Boise Cascade has assumed ownership of the venture's De Ridder, La., newsprint and linerboard mill, wood products plants, 330,000 acres of fee timber, and 290,000 acres of leased timber. Sonat will retain ownership of 110,000 acres of timberland and has obtained oil and gas rights on an additional 400,000 acres of Boise Southern timberland. The agreement provides Boise with harvesting rights on the 110,000 acres taken by Sonat and an option to purchase those lands. ■

EXPANSION

IP labor pact triggers major conversion at Pine Bluff

Union members at six International Paper Co. southern mills ratified a proposal in December to institute separate labor contracts at each facility rather than continue the current practice of negotiating in a multiple unit. "This is an excellent first step in resolving a number of issues that will make it possible for the company to keep the Camden, Ark., mill in operation for at least two years and to recommend major investments of several hundred million dollars in the Pine Bluff, Ark., (shown above) and Moss Point and Natchez, Miss., mills," said David W. Oskin, the company's vice president of human resources.

The company moved quickly to a decision on Pine Bluff. IP said it will install about 200,000 tpy of coated groundwood paper capacity at the mill, with startup scheduled for the second half of 1986. Expenditure on the project is estimated at more than $200 million. A decision on investments at the Mississippi mills is pending, however. Still to be resolved are marketing analyses, favorable engineering studies, financing, and securing environmental permits.

Pine Bluff conversion. To accomplish the plan, IP will convert a newsprint machine at the mill. It is believed that paper machine No. 1, a 120,000-tpy unit, will be converted since the other newsprint unit at the mill, No. 3, can make only 55,000 tpy of paper. No. 1 is a 275-in.-trim unit with an operating speed of about 3,000 fpm.

The two machines were shut down Feb. 7, 1984, as part of a plan to get the company completely out of newsprint (*P&P*, Feb., p. 23). Before the newsprint machines shut down, the company made 64 and 65 brightness groundwood specialties offset sheets there on an experimental basis as part of the process of assessing the mill's future products. The mill also makes about 375,000 tpy of bleached board on a third machine which is being modernized (May 1983, p. 29).

When the Pine Bluff mill was actively making newsprint, the two paper machines were supplied with stone groundwood pulp for 70% of the furnish and semibleached kraft for 30%. The mill has current capacity to produce about 420,000 tpy of bleached and unbleached kraft pulp and 120,000 tpy of mechanical pulp.

John Georges, IP's president and CEO, (who will be moving up later this year to chairman) noted that "coated publication paper is an expanding business and, with this investment, we will be able to make a top-quality product from southern fiber."

Help still needed at Camden. In addition to the favorable union vote on a separate contract, continued running of the Camden mill is still heavily dependent upon assistance and support from state and local officials, primarily in taxes and utility cost areas, according to Peter Redfern, mill manager. The proposal also includes a two-year wage freeze for Camden employees.

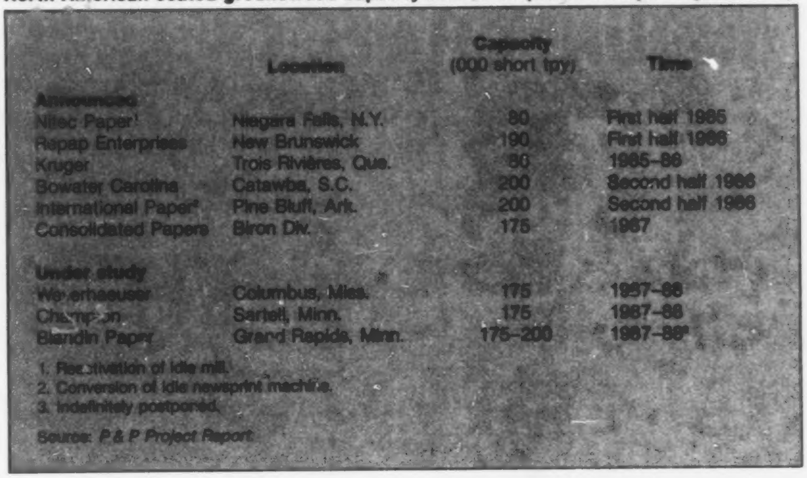
"IP officials, Arkansas and Camden officials, and leaders of the United Paperworkers International Union have been meeting together regularly in an attempt to work out the needed relief from tax and utility costs that would put the Camden mill in a more favorable cost position and allow it to compete more effectively," Redfern said. The mill relies heavily on purchased electricity because low-pressure boilers limit its ability to cogenerate power.

Only last November IP announced that it planned to permanently close the 255,000-tpy unbleached kraft paper mill in April 1985, calling the move an "economic decision." However, the company indicated no plans to sell its nine bag and sack converting plants even though closure of Camden would have represented the last of the company's unbleached kraft paper production facilities (Dec., p. 23). This puzzled some industry observers, given the tightness of the kraft paper market due to other capacity withdrawals.

The Natchez mill, which has capacity to produce about 1,100 tpd of bleached kraft dissolving and paper-grade hardwood and softwood pulp, was built in the early 1950s. Moss Point has the capacity to produce about 760 tpd of bleached board and bleached packaging papers on three machines.

Two other IP mills in the former multiple bargaining unit are in Bastrop, La., and Mobile, Ala. ■

North American coated groundwood capacity additions. (Source: *Pulp & Paper Week.*)



	Location	Capacity (000 short tpy)	Time
Announced			
Nitec Paper[1]	Niagara Falls, N.Y.	80	First half 1985
Repap Enterprises	New Brunswick	190	First half 1986
Kruger	Trois Rivières, Que.	80	1985–86
Bowater Carolina	Catawba, S.C.	200	Second half 1986
International Paper[2]	Pine Bluff, Ark.	200	Second half 1986
Consolidated Papers	Biron Div.	175	1987
Under study			
Weyerhaeuser	Columbus, Miss.	175	1987–88
Champion	Sartell, Minn.	175	1987–88
Blandin Paper	Grand Rapids, Minn.	175–200	1987–88[3]

1. Reactivation of idle mill.
2. Conversion of idle newsprint machine.
3. Indefinitely postponed.

Source: *P & P Project Report.*

BCFP decides against LWC expansion at Blandin Paper

Despite a robust lightweight coated paper market and widespread expectations of healthy LWC conditions through the end of the decade, British Columbia Forest Products Ltd. has decided not to install a new machine at its Blandin Paper Co. subsidiary.

Expansion of Blandin's Grand Rapids, Minn., mill had been widely expected, and the BCFP decision not to spend the C$300 million required is sure to have a significant effect on market conditions in the closing years of the decade.

BCFP did say a new machine at Grand Rapids is still a "very high priority" for the future. But it pointed to depressed conditions in other product areas where BCFP competes, such as newsprint, market pulp, and wood products, and said it would be "unwise for the company to undertake a project of this dimension until more stability is apparent in the market and higher earnings are achieved." BCFP, like other British Columbia firms, has turned in a poor financial performance in recent years.

A Canadian security analyst who was critical of the decision to junk the expansion commented that this "certainly looks like another mistake" on BCFP's part. He called it the latest in a string of BCFP miscalculations that he believes stretch back to include a muffed plan to build a newsprint mill—later changed to a market pulp facility—in Alberta, and a decision to install a new newsprint machine at Crofton, B.C., in 1982—just when a huge bulge of new capacity was coming onstream.

But BCFP clearly couldn't afford a major project like this now, and it apparently couldn't find ways to finance the expansion without going back to its overstrained lenders. In fact, it was still losing money in the first quarter of 1985, and management presumably felt it should get a few quarters of profits under its belt before taking on any more big challenges. ■

Chesapeake plans switch to corrugating medium

Chesapeake Corp. announced plans last month to modify No. 1 machine at its West Point, Va., mill to produce corrugating medium, a new product for the company. The project is expected to cost $28 million and to be completed by the end of 1986.

Work on the 55-year-old, 228-in.-trim machine, which now produces kraft linerboard, is scheduled to begin in the first quarter of 1986 following the startup of Chesapeake's new 900-tpd No. 3 linerboard machine in late 1985.

The rebuild will include modifying the fourdrinier, installing an incline size press, replacing the press section, and rebuilding the winder. Following the rebuild, No. 1 machine will have the capacity to produce 153,000 tpy of corrugating medium, although the machine will also still be able to produce linerboard, Chesapeake said.

The company will install a new 600-tpd forced secondary fiber processing system complete with high-density screening and dispersion to supply the rebuilt unit. This forced processing system is believed to be the first installation of its kind in the U.S.

The West Point mill currently has capacity for 1,505 tpd of bleached and unbleached kraft pulp and 1,060 tpd of kraft paper and linerboard. Upon completion of the expansion in 1986, mill capacity will total about 2,200 tpd of kraft paper and linerboard, corrugating medium, and bleached hardwood kraft market pulp.

No. 3 linerboard machine is designed to achieve an eventual production level of 1,200 tpd. ■

Port Townsend completes paper machine rebuild

Port Townsend Paper Co. recently released additional details on the modernization program for its Port Town-

INTERNATIONAL TRADE

EEC fines producers in pulp cartel case; appeals expected

Virtually all of the North American companies found guilty in the European Economic Community's three-year pulp price-fixing investigation are expected to appeal the decision, attorneys and executives for the companies told *Pulp & Paper*. The decision, made public Dec. 20, imposes a total of $2.97 million in fines on 36 bleached sulfate market pulp producers, claiming they colluded to fix prices in Europe between 1973 and 1981. Investigations began in 1981.

The EEC commission levied varying fines on each of 15 North American companies, as well as the Pulp, Paper & Paperboard Export Assn. None of those cited had received the text of the decision as of early January, however, learning of it instead through unofficial communications, they noted.

Most of the companies said they will appeal the EEC's verdict to the European Court of Justice in Luxembourg. They must file within 90 days of the time they receive formal notification of the decision. Because of the delay in getting the documents, some companies have not yet definitely decided if they will appeal but most feel it is likely.

The PPPEA is also likely to appeal, said one close source. It was fined separately by the EEC, although a number of the companies cited individually are also members of the association, observers have indicated. The PPPEA, formerly known as the Kraft Export Assn., has lost some members since the EEC investigation was begun in September 1981, including International Paper Co. and Chesapeake Corp. About ten members remain, sources say.

Many of the producers feel the EEC cited many of them for their participation in the PPPEA. But other companies, such as Bowater Carolina Co., were never members of the association. In a statement issued following notification of the EEC's decision, Bowater said it would file an appeal, noting that the EEC's verdict that the producers were guilty of "parallel pricing . . . alone is not an antitrust violation in either the U.S. or Europe."

Other close observers indicated that many of the appeals would include such bases as participation in the PPPEA giving members immunity to antitrust violations since the U.S. Webb-Pomerene Act legalized export cartels. Others note that a parallel investigation conducted by the U.S. Federal Trade Commission in 1982-83 was dropped after evidence of price-fixing was found unsubstantial (*P&P*, July, p. 27).

Conditions cut fines. Fines were reportedly reduced for those companies which agreed to "quote, sell, and invoice in the EEC at least 50% of their bleached kraft pulp in local currency of the buyer" rather than the usual U.S. dollar price, according to the EEC finding. Swedish companies could reportedly sell the other half of their pulp in krona or other EEC currencies; Finnish companies in any currency except the krona or U.S. dollar; and Canadian companies in U.S. dollars and Canadian dollars, or buyer currencies.

EEC fines imposed on major pulp suppliers.

Company	Fine (US$)
Canada:	
British Columbia Forest Products	$72,000
Canadian Forest Products	90,000
MacMillan Bloedel	108,000
St. Anne-Nackawic	144,000
Weldwood of Canada	36,000
Westar Timber	108,000
United States:	
Bowater	360,000
Chesapeake	36,000
Crown Zellerbach	36,000
Federal Paper Board	72,000
Georgia-Pacific	108,000
International Paper	180,000
Mead	36,000
Scott Paper	36,000
Weyerhaeuser	36,000
Pulp, Paper & Paperboard Export Assn.	36,000
Finland:	
Finncell	72,000
Sweden:	
Billerud	36,000
Stora Kopparberg	108,000
MoDoCell	108,000

The largest fines were generally imposed on North American firms, the heaviest falling on Bowater Inc. ($360,000); International Paper Co. ($180,000); St. Anne-Nackawic Pulp & Paper Co. ($144,000); and Georgia-Pacific Corp., Westar Timber Ltd., and MacMillan Bloedel Ltd. ($108,000). Two major Swedish producers were also fined $108,000 (see table). "North American companies were the least guilty but were fined the most for fighting the charges," one Canadian executive complained.

Companies reportedly can still reduce their fines by as much as 90% by agreeing to EEC conditions, which also include not quoting prices on a quarterly or regular, predetermined basis. It was unclear, however, how many companies in North America will agree to selling half their pulp in local currency. One Canadian industry executive estimated that selling in local currency would raise his company's cost of doing business by 3%.

It is uncertain if European customers will buy pulp in other than dollars, especially if the U.S. dollar weakens. A Scandinavian sales organization recently trying to sell pulp in D-marks was reportedly rebuffed by German buyers who wanted to pay in dollars.

Reasons for decision. The commission lists three reasons for its decision, indicating that producers who were found guilty "concerted" in price announcements and charges to customers, exchanged information on pricing, and prohibited the resale or export in the EEC of pulp sold there. (The resale ban may have been in contracts but is largely meaningless since pulp is rarely resold, according to industry observers.)

A Canadian executive close to the case called the local currency stipulation "blackmail," noting that it wasn't part of the EEC's original case and did not relate to the allegations. The EEC, however, feels trading in local currency will "reduce substantially the artificial transparencies of this market, and thus make future concertation more difficult."

Acquittal expected. With the exception of Bowater's, most of the fines imposed are small, and many of the companies do not appear concerned about them. Most companies, however, do feel strongly about being accused of crimes they say they did not commit and feel certain the Luxembourg court will acquit them.

One observer noted that, while many of the American producers did agree to a "local currency" stipulation that reduced their fines, this was not an admission of guilt. Observers indicate that except for Bowater and IP the U.S. companies agreed to conduct 50% of their pulp sales in Europe in local currencies. None of the Canadian companies agreed, they said.

Many of the 56 producers worldwide named initially in the EEC's investigation were not cited in the final decision, which included a list of 43 in the U.S., Canada, Sweden, and Finland. Companies dropped from the case were the Canadian producers Domtar Inc., Consolidated-Bathurst Inc., and Thurso Pulp & Paper Co. and U.S. companies Allied Paper Co. Inc., Brown Co., Brunswick Pulp & Paper Co., Buckeye Cellulose Corp., ITT Rayonier Inc., Parsons & Whittemore Inc., Temple Eastex Inc., and Western Kraft Paper Group.

Among the companies which plan to appeal are: Bowater, Canadian Forest Products Ltd., Crown Zellerbach Corp., Federal Paper Board Co., MacMillan Bloedel Ltd., Mead Corp., Westar Timber Ltd., and lastly, Weyerhaeuser Co.

The following companies indicated they were likely to appeal but were still undecided: British Columbia Forest Products Ltd., Chesapeake Corp., Georgia-Pacific Corp., International Paper Co., as well as the Pulp, Paper & Paperboard Export Assn.

Unavailable for comment were St. Anne-Nackawic Pulp & Paper Co. Ltd. and Weldwood of Canada Ltd. ■

EEC, Canada end dispute on duty-free newsprint quota

Canada and the European Economic Community have agreed to a tariff-free quota of 600,000 metric tpy for newsprint imported into the EEC beginning in 1985, ending talks begun in mid-1983, observers reported.

Although the level is 150,000 tpy lower than that most recently sought by Canada, and below the amount Canada has exported to Europe in recent years, it is well above the projected 1984 figure. According to the Canadian Pulp & Paper Assn., Canada exported 485,300 tons during the first 11 months of 1984 compared with 617,300 tpy during the same period a year earlier.

Talks between Canada and the EEC commission began a year and a half ago in an attempt to reduce the existing 1.5-million-tpy quota beginning January 1984, when tariffs on Scandinavian newsprint were to be eliminated under a previous agreement. Scandinavia and Canada supply virtually all newsprint imported into Europe.

Late last year, a special arbitration panel ruled that the EEC was obligated to negotiate a new quota with Canada (*P&P*, Jan., p. 37). In January 1984, the commission imposed a 500,000-tpy level without Canada's consent but later increased it to 635,000 in two actions initiated by some EEC countries concerned about a shortage of newsprint.

Some Canadian paper industry observers are satisfied with the new quota, indicating that while it is lower than the newsprint exported in some prior years, shipments this year would have been below normal levels anyway due to falling demand, unfavorable exchange rates, and new British newsprint production that has cut into Canadian export markets. Others fear the new quota could severely curtail their markets in the long run, however. No provision was made to renegotiate the quota if demand should pick up. ■

LABOR

"Massive" wage cuts imposed at ITT mill

Contract negotiation talks have recessed for some time on the West Coast, with strikes at Crown Zellerbach Corp.'s West Linn, Ore., mill and California Paperboard Corp.'s Santa Clara, Calif., mill continuing with no end in sight, observers reported (*P&P*, Jan., p. 37).

At ITT Rayonier Corp.'s Port Angeles, Wash., mill, the Assn. of Western Pulp & Paper Workers released details of an offer the company implemented recently despite earlier union rejection of the offer. Noting that the contract contains "massive takeaways," the union said labor's wages would be decreased by 10%/4.7%/4% over a three-year period expiring January 1988. Also, benefits such as vacations and call time would be reduced.

Workers at ITT's Port Angeles, Wash., mill, are unhappy with latest contract.

California Paperboard Corp. also imposed its final contract offer despite rejection by AWPPW workers there, and early in January was considering hiring replacements for the strikers, an industry spokesman said. The mill has been on strike since Sept. 21, but has operated one machine during much of the walkout. The contract calls for pay hikes of 35¢/40¢/35¢ over three years.

• In the meantime, **Louisiana-Pacific Corp.**'s Ketchikan, Alaska, mill came back up in December after being down since June 29 due to lack of orders, observers reported.

The contract negotiations with the AWPPW continued with no job action imminent, although members earlier gave strike authorization should talks break down. The two sides are set to return to the bargaining table on Jan. 14 under the auspices of a federal mediator, the AWPPW reported. ■

Wage settlements: a downward spiral

The Conference Board, a business-funded research group, predicts that first-year wage and benefit gains in union contracts will average about 4% in 1985, significantly less than the 5% inflation the Board expects and well below the 6.5% average pay increase that many compensation specialists are anticipating for salaried employees.

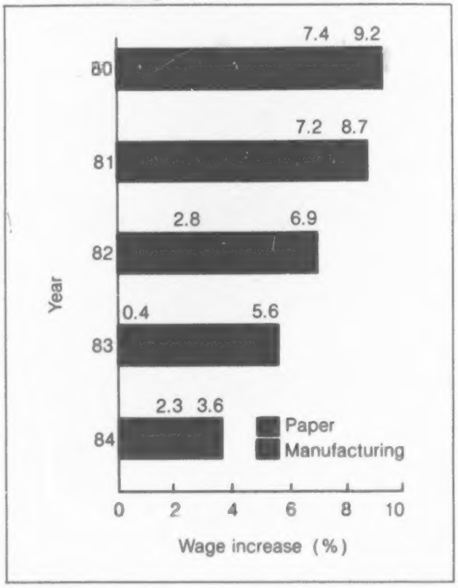
TOO SUCCESSFUL. 1985 will be a modest year for the collective bargaining calendar, with approximately 2.4 million workers' contracts up for renegotiation. A new member of the bargaining committee seems to have appeared this year—international competition. Foreign competitors increasingly cause the American worker concern over being "too successful" at labor negotiations. If companies are to remain competitive, they must eliminate contract provisions that restrict productivity, and unions must recognize the facts of economic life in the U.S. in 1985. Of the 102 million people employed, the number represented by unions is continuing to decline. Most recent data indicate that less than 20 million employees (17.9% of the civilian work force) rely upon unions in negotiations with their employers. As deregulation continues, the role of the nonunion worker is becoming more important, as corporations with unionized work forces seek ways to compete effectively. The experiences of the trucking, rubber, and airline industries are cases in point.

In 1985 six airlines, the Teamsters, and the rubber workers—and toward the end of the year, American Motors and Chrysler—will be negotiating new agreements. GE and Westinghouse will bargain this summer—and their contracts should be bellwethers, in light of the companies' bargaining histories. When GE last bargained in 1982, it was one of the few companies from a major smokestack industry (other than the paper industry) that did not seek a concession-oriented agreement. As a result, wage costs have climbed by almost 20% and may now be in a position for further adjustment.

Paper industry wages have continually outpaced those of the manufacturing sector (FIGURE 1). Of particular significance is the 1982-83 period when most of American industry was bargaining for concession agreements—and the paper industry continued with its generous ways. Although its 1984 wage settlements seem to be more in line with the rest of American industry, the paper industry wound up with 5.2% in wage increases in the past year—discounting those companies who gave no wage increases—a level far in excess of the reported increase in inflation.

One interesting aspect of paper industry employment is that it actually pays *more* for less time worked (including vacation time, holidays, sick pay, etc.) than any other major industry (e.g., chemicals, petroleum, primary metals, etc.) in the U.S. And because the paper industry's labor contracts are usually effective for two or three years, its bargaining will affect the industry for several years to come. Other industries are approaching the need to lower wages more aggressively. Evidently the paper industry considered itself relatively immune from foreign competition, but the unusually strong U.S. dollar has attracted foreign competitors to the U.S. market. What this will mean for 1985, with its significant bargaining calendar in the South and the Midwest, will be interesting. With most economists predicting 1985 inflation at a relatively modest 4% to 4.5% along with the tightening of the international market, chances are better than average that the downward spiral in wage and benefit settlements will continue.

FIGURE 1: **First year wage increases: paper vs all manufacturing.**



JULIAN M. KIEN
is contributing editor-human resource management for
Pulp & Paper.
Kien is president of Kien Associates, Inc., New York, N.Y.

CROSS-DIRECTION
CONTROL

CROSS-DIRECTION CONTROL IS STILL TOP PROCESS AUTOMATION TREND

Recent survey found 960 systems had been installed at the end of 1984; paper industry has spent $500 million with no letup in sight

By KENNETH E. SMITH, Executive Editor

■ The availability of reliable, accurate sensors, sophisticated control schemes, and a variety of actuators, combined with the obvious benefits, have made cross-direction (CD) paper machine control of moisture, basis weight, and caliper the dominant process automation trend of the 1980s. The pulp and paper industry has invested more than $500 million in CD control, most of it in the last five years. By the end of 1984, an estimated total of 960 computer-controlled CD systems (caliper, moisture, and basis weight each count as one) had been installed in the industry worldwide.

The benefits of CD control have been well documented. CD control was first applied to newsprint but is applicable to all grades. Producers of newsprint, uncoated free-sheet, and other highly competitive grades have found that CD control is required to produce the quality demanded by their markets. Producers of other grades have found CD equipment readily justified by payback periods of three to six months. Savings of up to $3 million/year have been documented for machines with "total" (weight, moisture, and caliper) control. Adding total cross-direction control to existing machine-direction control systems is said to cost about the same as the original machine-direction control system, while the typical economic benefits of CD control are reportedly twice those of machine-direction control. Table 1 summarizes benefits claimed for CD.

TABLE 1: **Claimed benefits of cross-direction control.**

Results	Fine paper	News-print	Brown grades
Reduced rejects (%)	40 to 60	50 to 75	15 to 30
Decreased fiber use (%)	1 to 3	2 to 4	3 to 5
Reduced additives use (%)	5 to 10	—	—
Steam savings (%)	3 to 5	1 to 4	5 to 8
Increased speed (%)	3 to 5	3 to 5	5 to 12
Reduced breaks (%)	30 to 40	30 to 40	30 to 50
Reduced chemical furnish (%)	[illegible]	1 to 4	—
Increased trim (in.)	—	1 to 5	—
Increased coater speed (%)	1 to 4	—	—
Improved winder performance			
Fewer breaks (%)	40 to 60	50 to 75	30 to 50
Fewer rewinds (%)	50 to 60	50 to 70	—

CALIPER WAS FIRST. Caliper control is the oldest and most common form of CD control and was first used in the mid-1970s (Figure 1). Newsprint producers have found that they need this control (and twin-wire forming) to produce the quality demanded by today's publishers. Moisture profile control has gained popularity in recent years because this application is probably the easiest to justify economically. Moisture controls led the other applications in number of installations in both 1983 and 1984 (Figure 2).

Basis weight control is the newest and least common of the three applications because it is the most difficult and requires complex control algorithms (Figure 3). However, AccuRay and Measurex have developed sophisticated "dynamic" or "self-tuning" control models, and Sentrol has been licensed to use the model developed by STFI in Sweden to control cross-direction basis weight. Basis weight control is potentially the most profitable since it affects moisture, caliper, and other sheet properties.

A CD control system is made up of three components: a scanning gauge for measuring the cross-direction parameters to be controlled; a process control computer for displaying the cross-direction profiles, running the control algorithms, and controlling the actuators; and the actuator system itself, which is designed to correct profile variations. Three vendors—AccuRay, Measurex, and Sentrol—have dominated process computer and sensor sales in this market. Robin is now selling Lippke sensors and is offering CD control but the company does

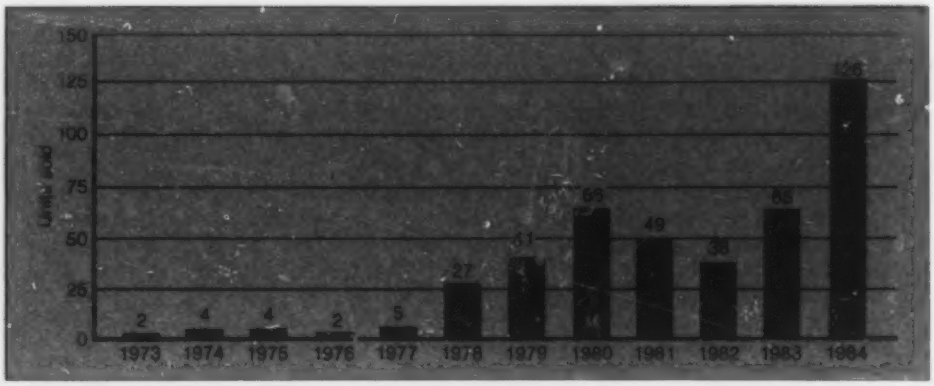


FIGURE 1: **Caliper cross-direction control sales by year.**

not yet have an installation in North America. Lippke has CD control installations on 12 paper machines in Europe, however.

Competition between the vendors for CD control system sales is as fierce as it has traditionally been for machine-direction and other control system sales. In 1984, AccuRay sold 160 systems while Measurex sold 208. In 1983, AccuRay reported 82 systems sold to Measurex's 99. Sentrol sold eight systems in 1983 and 18 in 1984. Cumulative CD control system sales in 1983 were double those in 1982, and reported CD control system sales in 1984 doubled compared with 1983, indicating the momentum of this trend. Measurex leads all vendors with 548 cross-direction control systems sold through 1984 and has been particularly successful with newsprint applications in Canada.

With approximately 2,500 paper machine computer systems installed worldwide and assuming an application potential of two cross-direction controls per machine, the total 960 CD control systems sold at the end of 1984 represents only about 20% of the potential retrofit market. Acceptance of CD technology is now so widespread that almost every new paper machine started up in the past two years has at least one cross-direction control.

ACTUATOR EQUIPMENT. While the sensor and process computer market for CD control is dominated by three companies in North America, more than 20 companies supply actuators (Table 2). Most of these systems are designed to operate on a stand-alone, manually controlled basis or to interface with a process control computer. Measurex supplies its own actuators for basis weight and moisture control in what it calls "single-vendor responsibility," or its control sytems can be interfaced with actuators supplied by other vendors. AccuRay supplies air showers for caliper control and has signed technology-sharing agreements with Devron Engineering, Midland-Ross, V.I.B. Systems, and Beloit. Actuators supplied by these companies are recommended and installed by AccuRay in turnkey CD control installations. Sentrol supplies no actuators but indicates a preference for Devron equipment.

Cross-direction caliper control actuators are based on the principle of increasing nip loading in the calender stack at selected cross-direction segments by varying the diameter of one or more calender rolls. Hot and cold air showers supplied by AccuRay, Lodding, and Midland-Ross are the most popular type of caliper actuator. However, controlled deformation rolls, such as Sulzer Escher Wyss's NIPCO roll and induction heating, are becoming

FIGURE 2: **Moisture cross-direction control sales by year.**

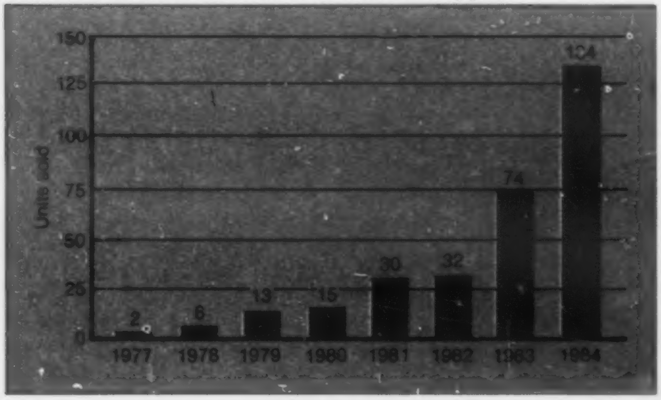


FIGURE 3: **Basis weight cross-direction control sales by year.**

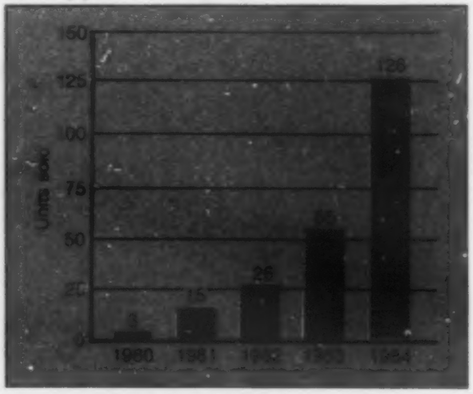


TABLE 2: **Cross-direction actuator vendors.**

Actuation principle	Vendor	Type	On Reader Service Card circle
Weight profile actuators			
Motorized slice lip			
	Ahlstrom	Mech. drive w/slice position feedback	401
	Beloit	Mech. drive w/slice position feedback	402
	Black-Clawson	Mech. drive w/slice position feedback	403
	Devron	Mech. drive w/slice position feedback	404
	Kobayashi	Mech. drive w/slice position feedback	405
	Sulzer Escher Wyss	Mech. drive w/slice position feedback	406
	Tampella	Mech. drive w/slice position feedback	407
	Voith	Mech. drive w/slice position feedback	408
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more commonly used in caliper control. A system for infrared caliper actuation has also been introduced.

AccuRay reports that in 1984 53% of its caliper controls used air showers, 30% used induction heating, and 17% used controlled deformation rolls. Prior to 1984 these applications were 78%, 18%, and 4%, respectively. In 1984, 50% of Sentrol's caliper controls utilized air showers, 25% featured induction heating, and 25% of them used infrared heating. Devron's CalCoil caliper actuator, which is based on induction heating, and Impact Systems' infrared caliper actuator will be discussed below.

Actuators for basis weight control can be grouped into three types: thermal expansion, thermal-hydraulic, and motorized. These actuators are added to or replace existing slice jacks to control slice position across the machine. Electrically heated thermal expansion rods are preferred by Measurex and offered as the Thermatrol system. Thermatrol utilizes Equilex rods developed by Chleq Frote, France. Equilex rods are hollow stainless steel rods that are engineered to replace existing slice rods. When a high-speed duty cycle current is passed through a low-voltage heating element inserted in the rod, the rod heats and expands. At the end of 1984, 130 of Measurex's Thermatrol systems had been sold, which represent 97% of the company's basis weight control installations.

Almost all headbox manufacturers offer motorized slice adjustment screws for their headboxes. In addition, Ahlstrom, Beloit, and Devron offer motorized systems for installation on practically any headbox. Beloit has sold 29 of its Belcomp systems, while Ahlstrom has sold six Alpro systems.

Devron offers its Auto-Slice system with either motorized or thermal-hydraulic slice jacks. According to Devron, the thermal-hydraulic actuator uses thermal expansion of a fluid to translate power input into linear movement of the spindle rods. The large range of response is not limited by physical constraints or variations in ambient conditions. Several optional features may be incorporated: a solenoid valve to lock the last lip position in power-down conditions and ensure bumpless startup; a force limiter to safeguard against lip deformation; and a position transmitter (L.V.D.T. type) to monitor actuator movement and enhance computer control. Since 1981, more than 35 Auto-Slice systems have been sold.

AccuRay reports that 52% of its basis weight control installations in 1984 utilized thermal-hydraulic actuators, while 42% of its installations were equipped with motorized slice jacks. The remaining 6% were "guidance" systems where all actuator setpoint changes are done by the operators rather than by a computer.

In all AccuRay basis weight control installations prior to 1984, 41% utilized thermal-hydraulic actuators, 44% included motorized jacks, and 15% were guidance. Sentrol reports that 75% of its basis weight controls sold in in the year 1984 use thermal-hydraulic actuators and 25% are guidance.

MOISTURE CONTROL. Moisture profile control is most commonly accomplished with segmented steam boxes, sheet rewetting sprays, and infrared drying systems. The most popular steam boxes are Measurex's Steamtrol and the Devronizer, which was developed by Devron and is marketed by Midland-Ross. Measurex supplied a total of 25 Steamtrol units, 14 of which were sold in 1984. More than 200 Devronizer units have been sold in the past two years.

Steam boxes are used on the fourdrinier, couch, or press section to increase sheet temperature by 70°F to 85°F in selected areas--usually 3-in. segments--which approximately halves the viscosity and surface tension of the sheet's water for easier removal in the presses. Moisture reductions of up to 5 percentage points are said to be possible.

Measurex says the cost of adding a Steamtrol system to an existing process measurement and control system is $200,000, which is typically paid back within six months. A payback period of 12 months or less due to increased production and/or improved moisture profile is normally guaranteed for Devronizers. Payback periods are said to average about three months.

The most popular sheet rewetting systems are supplied by Measurex (Aquatrol) and V.I.B. A total of 101 Aquatrol systems have been sold, including 45 sold in 1984. V.I.B. reports more than 100 installations since 1978, with 16 CD control installations in 1984 (see p. 84 of this issue).

Devron also offers its Hydro Profiler system and reports nine orders from North America. These systems are installed in the dryer section and add an extremely fine spray of water to 4- to 6-in. increments of dry areas in the sheet to even the moisture profile. Sheet moisture increases of 7 percentage points are claimed. The Aquatrol and Hydro Profiler systems are water pressurized, while the V.I.B. system is air atomized.

Devron claims that its Hydro Profiler, operating in conjunction with a Devronizer, is a net energy-saving system that can deliver a moisture profile with 2 sigma spreads of 0.2 percentage points at 8% average moisture. Measurex claims that the cost of adding an Aquatrol system to an existing process measurement and control system is about $200,000 with a six-month or less payback period.

Based on data supplied by AccuRay, Measurex, and Sentrol, 41% of all moisture control installations in 1984 utilized steam boxes, 49% used rewetting sprays, and 10% utilized infrared drying systems. Infrared systems will be discussed in more detail below. Some other forms of moisture profile control include NIPCO press rolls, segmented yankee dryer hoods, and pocket ventilation systems.

SEGMENTED INFRARED DRYING. In North America two methods of drying with infrared (IR) radiant heat are being used. Gas-fired emitters for CD control and coating drying applications, offered by Techmark and Eclipse, are currently running on 20 paper machines.

Electrically generated radiant heat systems, sold by Impact Systems, are online at more than 35 installations. Equipment is custom fit to specific applications (systems are drying all grades of coated and uncoated paper and paperboard) and can be linked with existing process control equipment.

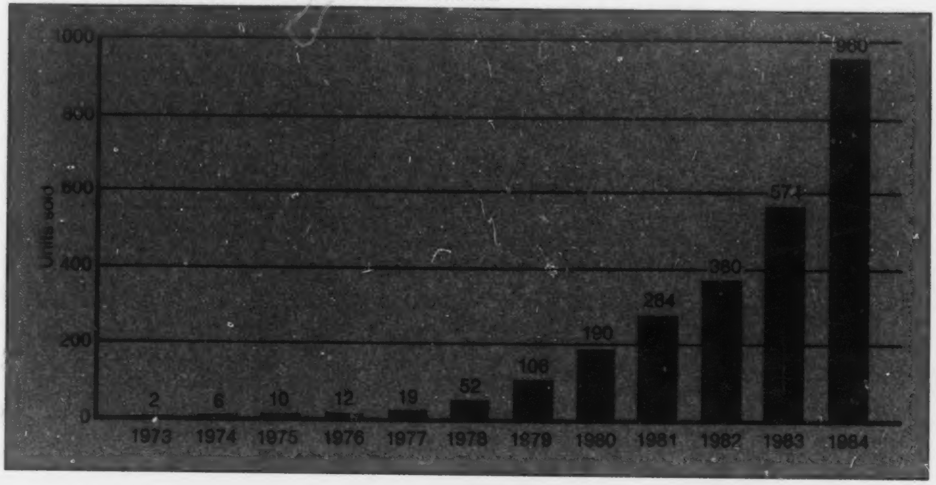
Increased production for dryer-limited applications seems to be their chief benefit and the major factor in determining the payback time for the units. Moisture variations have been significantly reduced (50% to 80%) at a number of locations (see p. 86 and p. 88 of this issue for details of two such installations).

The benefits of uniform moisture profile are not always easy to measure in monetary terms but, generally, finishing and converting operations of the product are said to be improved and customer quality complaints are reduced. Mills are able to sell more water, as moisture targets can often be increased 0.5% to 1.5% without any drastic changes in moisture profile or quality. Other reported advantages of IR drying are dryer section steam savings as well as reduced coating migration and press picking.

Electrical IR dryers and gas-fired dryers fit similar positions. The major difference between the two methods (other than energy source) is the temperature at which they operate. The Impact unit uses a fine tungsten wire heated to 4,000°F inside a lamp filled with halogen gas contained by quartz plates. The Techmark system utilizes natural gas combustion to heat nickel chrome plates to 2,100°F.

Both systems have air circulation. Impact showers cool air inside the profiler through slits in the quartz plates. Techmark has air inlet and outlet streams running countercurrent to the sheet, with 75% of the inlet air being recycled. Interfacing to CD process control computers has been achieved at some locations but the data

FIGURE 4: **Accumulation of all cross-direction controls.**



links and the software needed have not been available at other installations.

Prices for these systems vary with the size of the paper machine, number of profilers, and the application involved, but reports from mills with the systems installed generally fix capital investment at $100,000 to $700,000. The quickest payback reported is four months, and most mills see a full return on investment after about six months operation. New orders are frequently announced by the vendors, and sales should remain brisk through 1985.

Infrared drying in the paper industry has always caused concern among management over potential fire hazards. The emitters apply immensely concentrated heat directly to the fairly volatile paper web. Therefore, internal systems are required that would act immediately in case of fire or web break. Each system has automatic source-terminating mechanisms linked with detection devices that will rapidly cool down the emitting surfaces. Mills with infrared systems have often added other equipment or procedures designed to work with the drying systems.

Impact also has recently begun marketing an infrared-based system for caliper control called the Therma-Jet. Eleven have been sold since its introduction in late-1984. A control range three to six times that of conventional air systems is claimed for the Therma-Jet. Narrow control zone resolution of three inches and efficient heat transfer are other reported benefits.

Individually controlled IR units heat continuously operating air jets, which are then directed in an annular direction around a calender roll. According to Impact, a 22°F change in any control zone can take place in 6 to 8 min. Cooling is accomplished with room-temperature air, and no chiller is required. Cooling is said to occur much more rapidly than with induction-heated systems.

INDUCTION ENERGY SYSTEMS. Devron has had considerable success marketing the CalCoil unit for cross-direction caliper control. The system, which was developed by Consolidated-Bathurst, uses induction energy to heat a calender roll in individually controlled segments. An eddy current is induced in the roll, and resistance to this current causes roll surface heating. Segmented elements powered by a.c. current--called Work Coils--neither contact the roll nor heat up.

A recent installation reported reductions in caliper profile variations of 90% since the CalCoil replaced cold air showers and friction pads previously used on the calender stack, bringing caliper variations down to 0.02 mils (2 sigma). The benefits were said to include 64% fewer roll rejects due to hardness related reasons. Since it was introduced in 1983, more than 70 CalCoil systems have been sold--66% of which were sold in 1984.

Beloit offers its ECAMP (Eddy Current Automatic Moisture Profiler) for tissue machine applications. The ECAMP utilizes d.c. current and segmented electromagnets to selectively heat the yankee dryer shell for moisture profile control (see p. 77 of this issue for more details). Four ECAMP systems have been installed worldwide.

WHERE TO NEXT? Vendors feel that every cross-direction control system in the industry is a candidate for a CD retrofit. One recently stated that "any machine that cannot justify a cross-direction control installation will not be economically viable in five years." Future developments in this field will be faster, more accurate sensors, improved control algorithms, and more energy-efficient actuators. Many machines in the future will have integrated installations of all three cross-direction controls. Other parameters such as formation, gloss, and strength may also be controlled.

All numbers included in this article come directly from the equipment suppliers. Special thanks to Bob Kirsch of Weyerhaeuser, Tacoma, Wash., for sharing the results of an internal study he conducted on process control trends. For more information on available CD control systems, please contact the vendors directly, or use the reader service numbers shown in Table 2. ■

Chlorine output/demand grow, but prices remain steady

By BARRY SHOCKETT

Chlorine production and demand have continued to rise since 1982. Production growth was estimated at 10% last year, as the industry increased its operating rate to 80% (from 75% in 1983). The rise in total demand was also pegged at 10%. At the end of August 1984, chlorine output was up almost 10.5% compared with the same period in 1983.

U.S. statistics, chlorine (000 short tons)

	1981	1982	1983	1984e
Capacity	14,300	14,500	13,300	13,600
Production	10,558	9,176r	9,960	10,925
Imports	181.5	217	237	275
Exports	50.5	35	64	35
Apparent consumption	10,689	9,378r	10,133	11,165
Pulp and paper	1,400	1,200	1,300	1,450

r = Revised. e = Estimate. Sources: Bureau of Census, U.S. Dept. of Commerce; *Pulp & Paper* industry estimates.

Canadian statistics, chlorine (000 short tons)

	1981	1982	1983	1984e
Capacity	1,652	1,680.5	1,680.5	1,680.5
Production	1,424	1,360	1,527	1,600
Imports	27	23.5	47	25
Exports	181.5	217	237	275
Apparent consumption	1,269.5	1,166.5	1,337	1,337
Pulp and paper	562	501.5r	548	571

r = Revised. e = Estimate.

CHLORINE

UNITED STATES

Uses: Chlorine's major use by the pulp and paper industry is for bleaching kraft and sulfite pulps.

Demand: In 1984, the pulp and paper industry used an estimated 1.45 million tons of chlorine (13% of total demand), compared with 1.3 million tons the year before. The largest end-use is for EDC production.

Sources: At least 25 companies in the U.S. produce chlorine and caustic. The major chlorine producers (in descending order of nameplate capacity) are Dow Chemical, PPG Industries, Diamond Shamrock Corp., Occidental Chemicals, Olin, LCP, Georgia-Pacific, Vulcan Materials, Convent Chemical, and Pennwalt. Imports, all from Canada, were an estimated 275,000 tons in 1984, up about 38,000 tons from 1983.

Availability: Several plant closures during the past couple of years, together with some expansions, has brought the actual industry capacity to about 37,260 tpd (39,700 tpd in 1982). However, as caustic demand picked up in 1984, the tight chlorine situation eased. 1984, tight to market; 1983, market to tight; 1982, market; 1981, market; 1980, market; 1979, tight to very tight.

Pricing: Chlorine prices continued to rise in 1984, but to a lesser extent than was the case in 1982-83. A $15/ton boost on Jan. 1, 1984 was followed by a $25/ton hike at the end of March. Pricing history: 1984, $175-$200/ton, f.o.b. works, freight equalized; 1983, $145 to $175/ton; 1982, $145/ton; 1981, $145/ton; 1980, $145/ton; 1979, $135-$150/ton; 1978, $135-$145/ton.

Forecast: Over the long term, pulp-mill chlorine use will gradually decrease as ClO_2 substitution increases. However, 1985 pulp mill usage should surpass the 1.5-million-ton level if growth in pulp output this year matches 1984. By the end of August 1984, market pulp production was 6.8 million tons on an annualized basis (up 5.5% over 1983).

CANADA

Uses: Chlorine's major use by the pulp and paper industry is as a bleaching agent in kraft and sulfite pulp mills. Additional quantities are consumed in onsite hypochlorite makeup.

Demand: An estimated 571,000 tons of chlorine were required by the pulp and paper industry in 1984, an increase of 23,000 tons from 1983. The industry's share of total demand was about 42% in 1984 vs 44% in 1981. It dropped slightly in 1983 to 41% from 43% in 1982. The largest end-use last year was in the production of EDC, which made up 45% of the total.

Sources: Major merchant producers include (in descending order of nameplate capacity) Dow Chemical Canada, C-I-L, Canadian Occidental Petroleum, PPG Industries Canada, and lastly, FMC Chemicals. The four captive producers are Canso Chemical, Great Lakes Forest Products, Prince Albert Pulp (Saskatoon Chemicals), and St. Anne Chemical.

Availability: Although domestic demand was up in 1984 and the industry operating rate rose to 95%, no shortages were anticipated in the immediate future. 1984, market; 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight.

Pricing: There were no boosts in chlorine tags during 1984, the July 1, 1983 price remaining in effect all year. Pricing history is as follows: 1984, $344.75/ton, bulk, f.o.b. works; 1983, $308.45 to $344.75/ton; 1982, $254-$281/ton; 1981, $225-$254/ton; 1980, $195-$225/ton; 1979, $163-$195/ton.

Forecast: No chlorine price hikes are expected before mid-1985. Despite the slight decrease in bleached kraft output at the three-quarter mark in 1984 (a 2% drop vs 1983), chlorine usage by the mills last year probably rose about 4%. Continued recovery in pulp markets should boost mill consumption to the 590,000-ton level in 1985. Over the long term, chlorine usage will be reduced by ClO_2 replacement.

Mr. Shockett, of Corpus Information Services, Don Mills, Ont., is consulting editor, chemical markets, for Pulp & Paper.

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PULP & PAPER

March 1985

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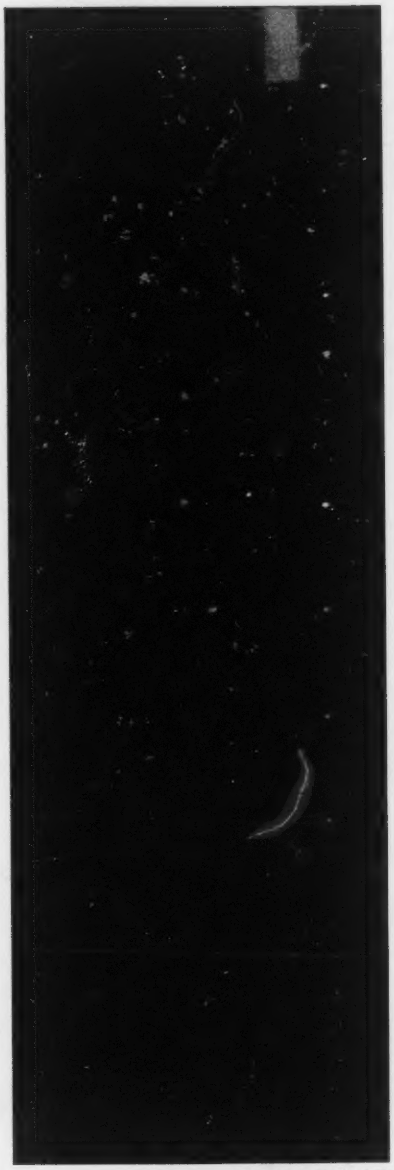

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(Staff photo by Ken Smith.)

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Office locations

AT = Atlanta: 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339; (404) 432-3186; Telex 275015
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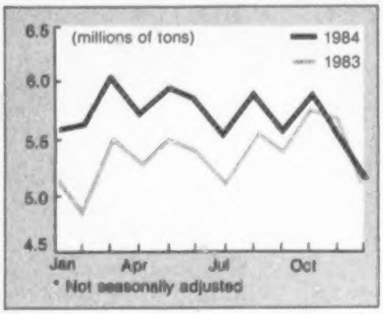
MONTH IN STATISTICS

U.S. paper and board production, 1984/83



December production of U.S. paper and paperboard maintained the pace recorded in November and October, said the American Paper Institute. The average of November and December seasonally adjusted rates was 68.2 million tpy, while the 1984 total was a record 68.8 million tons. This is 5.8% over the 1983 high. Output of paper and paperboard each came to 34.4 million tons, a 4.8% increase over 1983 for paper and 6.8% more for paperboard.

Among major grades, demand for coated paper remained strong throughout 1984. Production of coated paper reached a record 6.2 million tons, 9.2% above 1983 and about 97% of total capacity. Although production of printings/writings slowed toward the end of last year, the total output of 18.4 million tons was 5.8% above 1983's total. Production of packaging and industrial papers held up well in December. Output of unbleached kraft in 1984 was 3.7 million tons, equal to 1983's total.

Canadian newsprint shipments in December rose nearly 7% over December 1983 to 772,000 metric tons, according to the Canadian Pulp & Paper Assn. Newsprint mills operated at a 92% rate, up from 88% in November and equal to December 1983. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Dec.	429	1.2	5,543	7.3
Uncoated groundwood (s)	Dec.	115	−8.7	1,566	2.3
Coated paper (s)	Dec.	498	4.6	6,221	9.2
Uncoated free sheet (s)	Dec.	695	−1.3	9,150	4.4
Other printing/writing	Dec.	110	2.8	1,461	5.0
Total packaging and other paper (s)	Dec.	386	0.3	5,551	1.0
Tissue	Dec.	420	9.1	4,921	2.8
Total paper	**Dec.**	**2,653**	**−0.7**	**34,412**	**4.8**
Unbleached kraft paperboard	Dec.	1,154	1.9	16,032	6.9
Semichemical medium	Dec.	392	2.1	5,162	9.1
Bleached paperboard	Dec.	305	−0.7	4,059	3.4
Recycled paperboard	Dec.	575	1.2	7,971	7.7
Total paperboard	**Dec.**	**2,503**	**1.6**	**34,372**	**6.8**
Total U.S. paper and paperboard output	**Dec.**	**5,155**	**0.4**	**68,784**	**5.8**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Nov.	4,502	−3.1	55,857	5.8
Market pulp production	Nov.	579	−1.0	6,872	5.0
Wastepaper consumption at paper/board mills	Nov.	1,310	4.0	15,847	8.5
Pulpwood consumption (cords)	Nov.	7,153	−1.6	88,114	2.6
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Dec.	19.496	−1.4	268.100†	6.2
Containerboard inventories at U.S. box plants and mills	Dec. 1	2,632	9.0		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Nov.	909	6.4	10,646	25.8
Imports of Canadian newsprint	Nov.	N/A	N/A	N/A†	N/A
U.S. paper exports (including products)	Nov.	299	−26.0	4,372	−3.4
Exports of unbleached kraft linerboard	Nov.	113	−32.7	1,967	−7.2
Exports of woodpulp	Nov.	274	8.7	3,581	0.7
Norscan pulp inventories[4]	Dec. 31	1,621			
Norscan pulp operating rates[4]	Dec.	90%	96%	91%	88%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Dec.	772	6.9	9,034†	7.0
Operating rates		92%	88%	92%	85%
Inventories held by U.S. consumers	Dec. 31	1,342	13.8		
Other paper/board shipments	Dec.	220	−3.5	2,757	7.1
Woodpulp shipments (export only)	Dec.	590	−17.6	6,703†	−1.4
Operating rates	Dec.	81%	86%	86%	86%

[1] American Paper Institute. [2] API, Bureau of Census, American Pulpwood Assn. [3] Fiber Box Assn., Paperboard Packaging Council. [4] North American/Scandinavian paper-grade market pulp. [5] Canadian Pulp & Paper Assn. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

COATED FREE SHEET: Strong demand should last

Grade structure: Coated free-sheet papers contain no more than 10% groundwood pulp, with the balance being chemical pulp. Coated Nos. 1 and 2 have no groundwood content at all; No. 3 may contain none or only small amounts. About half of all No. 4 coated paper has enough groundwood content to be excluded from the coated free-sheet category, while the rest has 10% or less groundwood.

Basis weights for Nos. 1 and 2 are generally between 60 lb and 100 lb, while Nos. 3 and 4 are generally in the 45- to 90-lb area. Most coated free sheet is used by commercial printers, although nearly a fifth of No. 3 goes into books and magazines. Annual reports and promotional material are the major end-uses, other than publications, for coated free sheet.

Coated paper comes in finishes that include glossy, dull, matte, and embossed. Magazine paper tends to be glossy, while dull and matte as well as glossy are used for book and commercial printing end-uses. Embossed tends to be used for fancy printing jobs and makes up less than 2% of shipments in any grade.

Glossy paper is considered to have a gloss level of 45 or more on the Gardner gloss meter. The gloss level of dull paper can be as low as 25, and matte is 20 or below. One U.S. industry survey in the early 1980s reportedly showed that about 65% of all coated-two-side No. 1 used was glossy and 35% was dull, with a small balance left for matte and embossed. For No. 2, the spread went to 80% and 16% for glossy and dull, respectively. For No. 3, it was about 63% glossy, 3% dull, and 33% matte. The majority of the 375,000 tpy of coated-one-side paper is free sheet.

Production/capacity: Coated free-sheet shipments in the U.S. climbed faster than coated groundwood in 1984, rising at a double-digit pace. The fastest growing area of the coated paper industry was No. 4 group, where both free sheet and groundwood mills compete—shipments there jumped by 16% last year, according to one estimate. Other free-sheet grades were up by at least 10%. By contrast, capacity rose by 9.3%, according to American Paper Institute figures. Thus, operating rates increased over 1983 levels and mills basically ran full-out through 1984.

API estimates the industry will add 125,000 tons of capacity in 1985 by mill improvements, and 20,000 tons through new machines, which is assumed to represent Scott Paper Co.'s Skowhegan, Maine, machine.

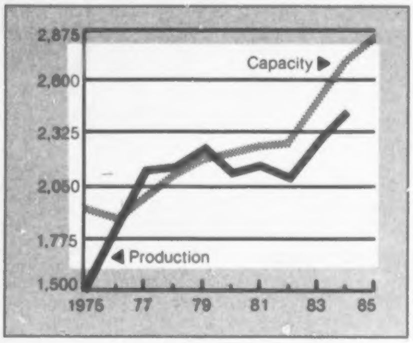
No major new U.S capacity is expected before late 1986, when International Paper Co. has indicated it may bring on 175,000 tons of new capacity somewhere, probably in the South. Westvaco Corp. is expected to up capacity by a net 150,000 tons by the end of 1988, with a similar boost coming in the following five years.

Outlook: No sign of real weakness had appeared in coated free-sheet markets in early 1985, although some mills did remove restrictive allocations for some grades at the end of 1984-85's annual report season. Demand is expected to roughly keep pace with capacity growth, holding operating rates above 93% at least through 1985.

Prices: Prices rose about as fast as demand in 1984, and discounts were not seen. Quotes increased by 9% to 13%, December-to-December, on average. Typical pricing trends ($/short ton, average price for year) are as follows for 70-lb No. 1 sheets: 1978, $880; 1979, $939; 1980, $1,021; 1981, $1,096; 1982, $1,148; 1983, $1,213; 1984, $1,321. For 60-lb No. 3 rolls: 1978, $621; 1979, $690; 1980, $750; 1981, $798; 1982, $798; 1983, $830; 1984, $919.

Markets: By far the largest share of coated free sheet goes into commercial printing. By one estimate, percentages sold directly to commercial printers, by grade, are as follows: Nos. 1 and 2, 95%; No. 3, 78%; No. 4, 48%. The second biggest market for No. 4 coated is magazines (35% of all No. 4 shipments). More than 80% of all coated-one-side paper goes to label and wrap manufacturers. ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1983	1984	1985e
Production[1]	2,278	2,526	2,664
Capacity[2]	2,473	2,704	2,849
Utilization rate	92.1%	93.4%	93.5%
Imports	25	45	45
Exports	45	41	45
Apparent U.S. consumption	2,258	2,530	2,664
lb/capita	19.35	21.49	22.40
GNP ratio	1.47	1.55	1.58

1. *P&P* estimate.
2. API capacity survey.
e = Estimate.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Scott Paper[1]	525	18.4
2. Westvaco	420	14.7
3. Champion Intl.	360	12.6
4. Mead	300	10.5
5. Consolidated	205	7.2
6. Potlatch[2]	170	6.0
7. Midtec Paper	140	4.9
8. Simpson Paper	123	4.3
9. Newton Falls	100	3.5
10. Boise Cascade	54	1.9

1. S.D. Warren Div.
2. Northwest Div.

Market share of top five companies:
63.5%
Market share of top ten companies:
84.1%
Total U.S. capacity (1985):
2.849 million short tons

(News section continues on page 25)

SALES AND EARNINGS

White paper market boosted profits in '84

High demand for coated publication papers led a strong market for papers in 1984, allowing companies to post "record high" sales. But depressed conditions in the timber and wood products industry forced many companies to write off past and projected losses in this sector. Earnings for the fourth quarter were especially affected by such write-downs.

U.S. paper/forest products results.

	Full year ($000)			
Paper companies	**Sales**	**Change 1984/83**	**Earnings[1]**	**Change 1984/83**
Boise Cascade	$3,816,850	10.6%	$124,800[2]	106.7%
Bowater Inc.	881,855	15.8	62,541	57.9
Champion International[3]	5,121,089	20.1	139,032[2]	69.2
Chesapeake	350,237	27.9	22,133	161.3
Consolidated	686,328	19.3	80,588	64.5
Crown Zellerbach	3,094,500	15.0	86,900[2]	−1.0
Federal Paper	637,450	12.0	37,075[2]	197.6
Fort Howard Paper	1,338,588	−70.3	133,076	24.4
Georgia-Pacific	6,682,000	10.6	253,000[2]	237.3
Great Northern Nekoosa	1,873,000	19.7	120,000	42.9
Hammermill	1,854,991	14.3	55,894	71.7
International Paper	4,700,000	6.8	120,000[2]	−52.9
Kimberly-Clark	3,616,200	10.4	217,500[2]	15.2
Longview (10/31)[4]	483,005	29.4	22,183	28.1
Louisiana-Pacific	1,230,000	11.6	22,700[2]	−1.7
Mead	2,720,200	14.9	139,300	227.0
Pentair	545,438	70.8	21,245	78.3
Pope & Talbot	320,799	14.5	(558)	n.m.
Potlatch	993,910	9.6	49,631	22.6
Scott	2,847,300	15.5	187,021	51.2
Jefferson Smurfit	678,112	13.1	24,504	141.6
Sonoco Products	740,869	10.8	42,535	26.8
Southwest Forest	777,394	22.2	14,042[2]	n.m.
Temple-Inland	1,262,900	7.4	102,700	113.1
Union Camp	1,973,781	16.9	181,451	36.7
Westvaco (10/31)[4]	1,776,267	18.3	129,974	107.0
Weyerhaeuser	5,549,738	13.7	270,187[2]	31.9
Willamette	1,181,910	13.0	66,221[2]	263.9
Total	**$57,734,711**	**14.3%**	**$2,725,675**	**44.9%**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. **Boise Cascade**: 1984 net excludes effects of $88 million pretax charge taken to restructure building products segment. **Bowater**: 1984 net exludes $11.0 million gain from discontinued operations. **Champion**: 1984 net excludes after-tax writeoff of $150 million for restructuring building products business and $5 million gain from St. Regis acquisition. **Crown Zellerbach**: 1984 results include pretax charge of $30.1 million to cover losses on timber cutting contracts and to restucture timber and wood products operations. **Federal**: 1984 net excludes $1.4 million gain from settlement of lawsuit. **Georgia-Pacific**: 1984 net income excludes $160 million after-tax charge from disposal of discontinued operations; 1984 net includes pretax gain of $19 million from sale of a building; 1983 net includes pretax charges of $135 million for the year and $67 million for the quarter from the writedown of assets and a pretax gain of $38 million for the year on settlement of a contract dispute. 1983 results restated by company to reflect discontinued operations. **International Paper**: 1984 net includes a pretax writeoff of $163 million to cover anticipated losses from the sale or closure of certain wood products facilities and expected losses on West Coast timber leases. 1983 net includes pretax gains of $123.7 million from land sale and sale of timber. **Kimberly-Clark**: 1984 net excludes $7.4 million gain from exchange of debt. **Louisiana-Pacific**: Yearly income figures exclude effects of extraordinary items in both years. Fourth-quarter 1984 net includes pretax gains of $23.5 million from sale of timberlands and $33.6 million from the sale of National Gypsum Co. common stock. **Scott**: 1983 sales restated to reflect accounting change. **Southwest Forest**: 1984 net excludes fourth-quarter after-tax charge of $10.0 million relating to federal timber contract buybacks. **Weyerhaeuser**: 1984 net excludes $44.0 million after-tax charge from writedown of closed and curtailed facilities and nonoperable contracts. **Willamette**: 1984 net excludes $5.2 million after-tax charge for termination of federal timber contracts.
3. Data includes St. Regis operations, 60% for Oct. and Nov., 100% for Dec.
4. Fiscal year is not calendar year; date indicates last quarterly report.

(   ) = loss. n.m. = Not meaningful.

Sales in fourth quarter 1984 for 29 U.S. paper companies were $15.5 billion, up 12.7% from 1983; earnings of $1.4 billion were up 140%. For 1984 as a whole, sales of 28 companies totaled $57.7 billion, an increase of 14.3%; net earnings of $2.7 billion were up 44.9%. (All earnings figures are after-tax income from continuing operations.)

The acquisition of St. Regis Corp. by Champion International Corp. in late 1984 created the nation's largest paper company and the second largest producer of lumber/plywood. Including contributions from St. Regis, 1984 sales of the new Champion Corp. were $5.1 billion, 37.4% below the combined 1983 sales of the two companies. In 1984, Champion's premerger business segments had an operating income of $232 million, up 50% over 1983.

International Paper Co. reported a net loss for 1984's fourth quarter of $74 million, due to a pretax charge of approximately $150 million to cover anticipated losses from the sale or closure of wood products manufacturing facilities and expected losses on West Coast timber leases. Sales were $4.4 billion (down 7% from 1983), and net income was $120 million (down 53%).

Great Northern Nekoosa Corp., a major newsprint, groundwood, and free-sheet business papers producer, recorded its highest sales ever at $1.9 billion and its highest earnings ever at $120 million.

Reported 1984 sales for Georgia-Pacific Corp. were $6.7 billion, up 11% from 1983. G-P's earnings, at $253 million, showed a stunning increase of 237%.

Temple-Inland Inc. may be the only firm to report record earnings in its building products segment. T-I's sales in 1984 were $1.3 billion and earnings were $103 million, up 113% over 1983. ■

STOCK PREP/
RECYCLING

Waste-to-energy incineration plants may cut future wastepaper supplies

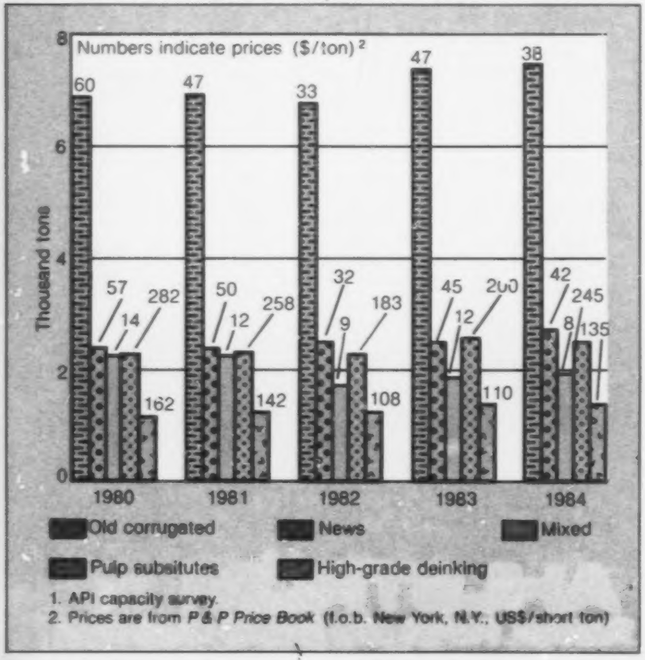
P&P survey finds the growing number of waste-disposal methods and unfavorable government regulation potentially threatening to recyclers

By MICHAEL J. DUCEY, Technical Editor

■ Secondary fiber mills may face a serious threat to their raw material source later in this decade. The threat comes from the unprecedented growth of waste-to-energy and other mass-incineration facilities planned for construction in major metropolitan areas throughout the 1980s. Growing with the number of these plants is the number of governmental forces that regulate municipal solid waste (MSW) stream components, direction, and, to some extent, end uses.

To put together this report on the latest developments in alternative waste disposal methods, on both national and regional fronts, *Pulp & Paper* took a survey, which included all 50 states, on the progress of "resource recovery." Comments on the subject were provided by industry associations, mills, and executives who are actively pursuing an agreement with public officials.

FIGURE 1: **Consumption and prices of all grades of wastepaper.**[1]



1. API capacity survey.
2. Prices are from *P & P Price Book* (f.o.b. New York, N.Y., US$/short ton)

WASTEPAPER CONSUMPTION. A brief overview of wastepaper use in the industry is shown in Table 1. Paper is separated from MSW at source separation centers, at transfer stations, or by the individual solid waste generator (commercial, residential, etc). The latter method accounts for the largest amount of recovered material. Several thousand recycling centers, public and private, are currently in operation in the U.S., while some 300 separate collection programs have been active since 1980.

Currently, the supply of wastepaper seems to be constant, but rapid changes in demand can cause wide fluctuations in price. Recovery is labor-intensive, and cost varies with the region (and with supply). Figure 1 examines the price history of different grades. Prices tend to fluctuate around economic conditions and will continue to do so in the future. One major factor in the consumption and price of wastepaper is the price of market pulp. Cheap market pulp lowers consumption of wastepaper as mills can afford to use more virgin fiber. But as secondary fiber is incorporated into a product line, particularly in the production of newsprint, the price stabilizes. Exports of wastepaper also influence the market as they are expected to grow strongly in the next five years.

WASTE-TO-ENERGY. Mass incineration of solid waste has been a disposal option for both private and public sectors since the early 1920s. Air pollution had been the major deterrent to constructing such facilities and was the reason for closing down many of them in the 1960s. The resource recovery facilities of today are all equipped to handle pollution (as required by law), but their problems are confounded by a number of other factors, such as operational safety, "scaling-up" engineering problems, lack of guaranteed fuel supply, financing, and government influences.

Many types of resource recovery facilities are in operation today. Mass incineration is most popular, having larger plants that can be used for MSW volume reduction and/or energy conversion. Two prevalent types of mass incineration are refractory-lined furnaces (usually for

TABLE 1: **Survey results showing resource recovery situation, by state.**

State	Operating resource recovery plants	Total wastepaper burned (tpd)	Future plants[1]	Recycling paper mills[2]	Mills' wastepaper consumption (tpd)	Does plan address recycling?[3]	Year statewide plan was enacted	Statewide plan[4]	Number of enacted flow control laws[5]	Towns with operating plants
Ala.	2	350	6	4	700	Y	80	RR	2	Huntsville, Tuscaloosa
Alaska	1	25	2	0	0	Y	81	N	0	Sitka
Ark.	3	200	10	1	125	Y		RR	0	Batesville, No. Little Rock, Osceola
Ariz.	0	0	1	2	300	Y	81	N	2	
Calif.	1	100	19	12	2,550	N			3	Susanville
Colo.	0	0	2	0	0	Y		N	1	
Conn.	1	125	9	6	900	P	85	RR	1	Windham
Del.	1	1,000	3	0	0	Y		Y	0	Wilmington
Fla.	5	5,400	10	1	100	Y	81	Y	7	Dade, Lakeland, Mayport, Pinellas, Pompano Beach
Ga.	0	0	1	4	875	Y	81	Y	Statewide	
Hawaii	0	0	1	0	0	Y	78	RR	1	
Idaho	1	50	5	0	0	Y		RR	1	Burley
Ill.	1	1,250	4	7	1,140	N			0	Chicago
Ind.	0	0	2	4	1,025	Y		RR	0	
Iowa	1	180	2	1	50	Y	80	Y	1	Ames
Kans.	0	0	1	1	30	Y	80	E	1	
Ky.	0	0	9	1	225	Y		RR	0	
La.	1	650	1	3	405	Y		EN	0	New Orleans
Mass.	3	1,620	12	4	400	P		RR	1	Saugus, Braintree, Pittsfield
Maine	1	170	7	1	150	Y		EN	0	Lewiston
Mich.	0	0	6	8	1,395	Y	78	RR	0	
Minn.	2	122	11	1	330	P		Y	3	Collegeville, Red Wing
Mo.	1	75	2	3	255	Y	80	Y	1	Ft. Wood
Miss.	1	150	5	3	273	Y		RR	0	Pascagoula
Mont.	1	70	2	0	0	Y		RR	0	Livingston
Md.	2	3,100	4	0	0	Y	85		1	Baltimore, Timonium
N.C.	1	200	5	0	0	Y		Y	2	Wilmington
N. Dak.	0	0	1	0	0	Y		N	0	
Nebr.	0	0	0	0	0	Y	82	Y	0	
Nev.	0	0	1	0	0	N		Y	1	
N.H.	3	324	10	2	110	Y	82	RR	0	Durham, Groveton, Portsmouth
N.J.	0	0	12	5	1,200	Y	79	RR	0	
N. Mex.	0	0	0	0	0	N			0	
N.Y.	8	8,500	12	15	1,666	N		N	10	Albany, Cuba, Glen Cove, Hempstead, New York City, Niagara Falls
Ohio	2	2,000	4	12	2,072	N		N	1	Columbus, Gahanna
Okla.	2	900	3	5	630	Y	84	N	1	Miami, Oklahoma City
Ore.	0	0	2	3	870	Y	83	D	2	
Pa.	1	520	6	8	1,050	Y		RR	4	Harrisburg
R.I.	0	0	1	0	0	Y	74	RR	0	
S.C.	1	50	3	0	0	N			0	Johnsonville
S. Dak.	0	0	1	0	0	Y		N	0	
Tenn.	4	810	6	4	525	Y		N	0	Dyersburg, Gallatin, Lewisburg, Nashville
Texas	3	100	12	5	835	Y	80	RR	0	Gatesville, Palestine, Waxahachie
Utah	0	0	2	0	0	N		N	0	
Va.	6	920	12	5	800	Y	82	Y	1	Salem, Portsmouth, Norfolk, Ft. Eustis, Harrisonburg
Vt.	0	0	4	2	45	Y		V	0	
Wash.	0	0	1	1	65	Y	81	Y	2	
Wis.	2	390	6	15	2,135	Y	81	Y	0	Madison, Waukesha
W. Va.	0	0	2	0	0	P		RR	0	
Wyo.	0	0	0	0	0	Y		N	0	

1. Projected through 1990.
2. Includes all mills consuming recycled paper.
3. Includes all enacted solid waste management plans, laws, or regulations. P=pending.
4. Y=yes; N=no; RR=plan addresses resource recovery only; E=exempt; EN=exclusion; D=disclaimer; V=voluntary.
5. Through either the municipality, county, or special waste district.

volume reduction only, but they can be retrofit for energy conversion with a waste-heat boiler affixed downstream) and water wall-lined furnaces, where heat transfer occurs with circulating water running through tubes along the furnace walls.

Refuse-derived fuels (RDF) are made in processes involving separators (for metals and other noncombustibles) and shredders for void volume reduction. These fuels are classified as fluff, densified/pelletized, wet, or powdered and are stored until fed to waste-heat recovery boilers. Modular waste-disposal units usually operate in two stages (separating and burning) and are applicable to small-scale processing (less than 200 tpd). New technology in this field is on the horizon, with methods of pyrolysis, chemical reduction, and fluidized beds receiving more attention.

Such facilities are initiated by the public sector because of a problem with an existing MSW system and/or an opportunity to profit from the situation (i.e., waste-to-energy). For example, New York City has recently moved forward with a plan to construct five incineration plants and to divert, by the year 1990, some 4 million annual tons (about half the city's total) of MSW away from the Staten Island landfill, which has only 15 functioning years remaining. Other reasons for building plants include available markets for the energy recovered (which would displace other higher-cost energy sources), such as industrial process steam, space/area heating, electricity generation, and mechanical energy conversion. *P&P*'s survey of the states found landfill problems in densely populated areas to be the chief incentive for construction. However, many of our respondents indicated that space heating, particularly for prisons and universities, is a popular use for these plants.

Sometimes the groups that finance projects dictate the final use to which the plants are put. Usually projects are financed either by general obligation bonds or through industrial revenue bonds issued by a government body (state, municipality, or special district). The public agency associated with the government body presiding over the project provides a guarantee to supply the facility with MSW over a long period of time. Contracts are arranged with trash collectors (public or private) who pay a "tipping fee" to dump MSW. Having established these contracts, the agency must then seek and obtain a long-term buyer for the energy recovered (again through contracts). As more MSW is received by the facility, more tipping fees are collected, more energy is produced, and the security of the bondholders is increased. Therefore, there may be an incentive to build oversize plants, making it difficult for other users of MSW to obtain raw materials, such as recyclable paper.

The recent income tax reform movement is posing a new financing obstacle for private corporations wishing to participate in the construction, ownership, and partnership of waste-to-energy plants. Under the Treasury Dept. plan, companies that build and operate these plants in partnership with local governing bodies would lose a host of tax breaks, including investment tax credits, five-year straight-line depreciation on most equipment, and accelerated depreciation on energy-generating gear. Perhaps the most important potential loss is the Treasury Dept.'s plan to reduce the tax-free status of industrial development bonds, thus increasing the cost of borrowing money to fund the construction and operation of a facility.

Another more tangible consequence of alternative disposal methods is operational safety. These plants have a record of many operation interruptions due to accidents. RDF plants seem to be more complex in handling MSW and, therefore, have more opportunities for accidents. An accident happened recently at an Akron, Ohio, plant, where a mixture of sawdust laced with toluene, xylene, and methyl ethyl ketone found its way into the shredder house and was ignited by a spark. A recent survey of RDF plant shutdowns revealed that the major cause for operation interruption was explosions (14%). Table 2 illustrates the plants' construction activity and operating records.

FLOW CONTROL OF SOLID WASTE. The agencies involved with solid waste control are branches of state and local government that deal with the question of solid waste management. Some states have their own solid waste authority, while others come under the jurisdiction of government departments such as natural resources, environmental protection or management, and health. The beginnings of flow control legislation for the solid waste stream quite often pass through these offices on their way to the elected officials. All along the route are financiers who lobby to obtain guaranteed control of the MSW, assuring its direction to the waste-to-energy plant. These efforts are a major concern of recyclers, who must themselves lobby to combat "air-tight" flow control.

In 1976, the federal government passed the Resource Conservation & Recovery Act (RCRA). The major provision in the act required states to submit solid waste management plans and addressed the recycling industry by "encouraging proven resource recovery technology." States complying with the law were to have plans by 1985, and *P&P*'s survey revealed that 42 had enacted or had pending statewide plans. These plans vary from state to state both in addressing resource recovery (particularly recycling) and in implementing statewide initiatives on a local level (Table 3). Most states have simply divided the federal money to accommodate local establishment of the plans, appointing a state office to oversee the local plans.

A state has many options in its approach to flow control. These include authorizing locally enacted control measures, requiring a state agency to authorize flow control, requiring local flow control, and defining ownership rights of MSW. If the state plan is too vague in areas such as the definition of solid waste or the goals of resource recovery, then problems can arise with the local plans dealing with MSW and resource recovery facilities. The American Paper Institute has sanctioned ten states (Georgia, Iowa, Kansas, Louisiana, Minnesota, North Carolina, Texas, Virginia, Washington, and Wisconsin) where the state solid waste acts have adequate language protecting recyclable material. These are mostly in the form of exemptions for reusable materials found in the waste stream.

One new approach is being tried in the East. New Jersey has introduced legislation mandating source separation at the original generating point in hopes of bolstering individual recycling efforts and curtailing flow control confrontations. The bill is being scheduled for a mid-1985 vote.

Flow control is achieved using either regulatory control or economic control. The first method allows the municipality to collect and dispose of its own trash, thus ensuring complete control. The municipality can enter into contracts with private haulers to collect and dispose of all or a portion of the trash at designated sites. The municipality can also use its permitting and licensing powers to require private haulers to deliver MSW to a designated site. Economic control is implemented by reducing tipping fees at desirable disposal sites, thus enticing haulers to deliver to those points. The same effect could be achieved by increasing tipping fees at existing sites, such as landfills.

LEGAL RAMIFICATIONS. The well-known case of Hyman Budoff, a trash hauler/source separator in Akron, Ohio, who sued the city of Akron because of its ordinance directing the entire MSW stream to the local waste-to-energy facility, is now in its fourth year of litigation. The plaintiff charged that the ordinance is in direct violation of the Sherman Anti-Trust Act, as a restraint of trade, and of the Commerce Clause of the U.S. Constitution, as unlawful seizure of property without just compensation. The city of Akron argued that an ordinance of this type is exempt from antitrust laws under the "state action" exemption. The city further argued that it was exercising proper police authority and was only inhibiting commerce, not seizing property. The latest development in this case occurred on Aug. 24, 1984, when the U.S. Court of Appeals for the Sixth Circuit—for the second time—upheld the Federal District Court's ruling that the city was immune from antitrust laws because of the broad authority Ohio cities have in regulating garbage services, together with the expressed powers of the state agency financing the facility. This ruling amounts to a clear endorsement of the state's right to monopolistic behavior in this situation.

In another case involving this question of exemption from federal antitrust (*Community Communications Inc. v. the City of Boulder, Colo.*), the same court held that a municipality can be liable for antitrust unless it is acting under the auspices of a state policy permitting such a restraint of trade. Thus, it seems that any flow-control ordinance of this type would not be effective unless it had state recognition and support under the state's own solid waste law or guidelines.

Also, the federal government is considering legislation providing for a "municipal action exemption," which would allow local governments to enact ordinances that undermine federal laws, particularly with regard to antitrust. Another consideration is the question of "home rule," a concept practiced by 30 states that allows municipalities to supersede state and federal legislation on antitrust unless expressly prohibited by state law (the Ohio case is awaiting a second hearing by the U.S. Supreme Court). Table 2 shows the activity of flow control within the states; note that as states move toward waste-to-energy and other disposal options, more legislative action is necessary. Table 4 shows that guaranteeing a MSW supply is common among the larger plants.

PAPER INDUSTRY POSITION. A number of executives in the paper industry are actively requesting that each state modify its solid waste management acts to directly address recyclable material. The most effective modification would be a clear exemption of recyclables from MSW at the generating or transfer points. This would allow the free market to operate inside any ordinance involving flow control unless Congress decides to enact a municipal action exemption.

TABLE 2: **MSW guarantees by facility size.**

Design capacity (tpd)	Plants in size group	Waste guarantee (%)
0 to 200	52	53.8
201 to 500	27	66.7
501 to 1,000	17	82.4
1,001+	31	87.1

TABLE 3: **Breakdown of resource recovery plants by type and activity data.**

	Type of plant			
	Mass-incineration	RDF	Modular	Total
Existing	32	22	29	83
Under construction	24	8	9	41
Planned	67	17	40	124
Operating efficiency (%)	93	73	84	82
Unplanned shutdowns (%)	47	64	39	52
Average tipping fee ($)	17.7	12.05	10.72	13.49

It should be noted that the paper industry supports waste-to-energy plants as a viable resource for future energy needs. In fact, one observer mentioned that recycling is usually promoted by solid waste managers until they realize that recycling by itself will not solve the problem. Then incineration is proposed, and the real question becomes one of how much incineration is needed.

To answer this question, governments tend to hire consultants to analyze the MSW stream and its components. Papermakers who use recycled papers do the same for their areas to determine the quality of the recyclable paper. Both entities usually find that eliminating paper from the MSW going to an incinerator does not significantly reduce the energy content of the fuel. In a study done for Garden State Paper Co. Inc. on the compatibility of recycled newsprint production and MSW incineration/energy conversion, it was concluded that at recycling rates of 25% and 50%, the Btu output of a plant operating without newsprint recycling vs one with recycling differed only 3.5% and 7.0%, respectively. And when the energy required to produce newsprint from virgin fibers (referred to as the life cycle energy balance) is accounted for, the energy savings dramatically offset the losses incurred by removing newsprint from the waste-to-energy facility.

To summarize the paper industry's position, we must take a closer look at today's recycling laws. API notes that 1984 was a record year for paper collection (10% more than in 1983), reuse, and export. Demand increased for two reasons: increased recycled paper production and increased private consumption (such as small-scale burning for steam production), which encouraged more collection. These reasons hold true for the past two decades during which collection has increased two-fold without the help of government intervention. Changing the laws may only hamper these activities instead of protecting the free market system, which has begun to create new uses and technologies for these vast resources. ■

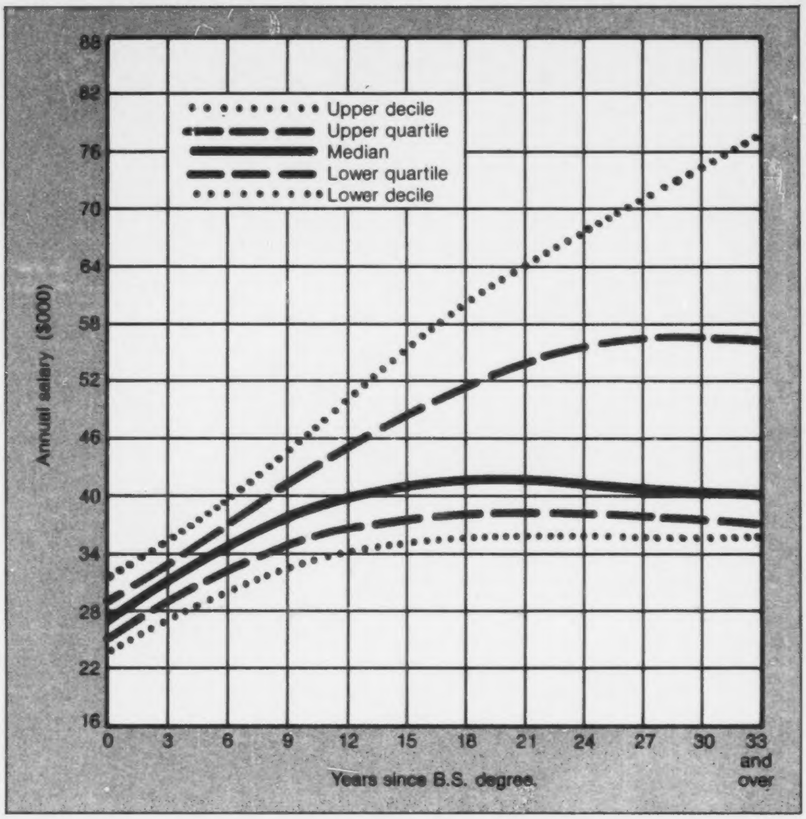


FIGURE 1: **Annual salary of engineers in the paper industry since B.S. degree.**

Paper industry salary increases

By DEBORAH S. SOLLOSI, Staff Editor

■ Engineers in the paper industry were paid a median salary of $40,000 in 1984, up a modest 3.5% from 1983 salaries, and slightly below the 4.6% inflation rate for the period. Paper industry engineers' median salaries still exceeded the average median for 16 major industry groups, however, estimated at $37,850, according to a survey by the Engineering Manpower Commission of the American Assn. of Engineering Societies.

The commission's report, which is published yearly, surveyed more than 650 organizations, representing about 93,000 engineers. Questionnaires were mailed in February 1984, and the salaries reported were in effect Feb. 1, 1984. The computer industry was added as a new group in the 1984 survey.

The 1984 median salary for paper industry engineers ranked fourth when compared with the 16 major industry groups listed in Table 1, and the 3.5% rise over last year's median salary for the paper industry is on a par with the 3.4% average 1984 increase for the groups listed. Salary increases for other industry groups range from a 16% hike for engineers in local government to an actual decline of 21.6% for federal government engineers. Altogether, three groups showed decreases in median salaries paid, with mechanical engineers and lumber and wood products engineers' salaries both dropping 1.7%.

Salaries paid to all types of engineers in the paper industry are presented in Figure 1, which plots annual salary against the number of years after receiving a bache-

TABLE 1: **Engineers' median salaries by industry group.**

Industry	1984 salary	1983 salary	% change
Petroleum	44,850	44,650	0.4
R & D	44,700	42,250	5.8
Mining	41,650	38,850	7.2
Paper	40,000	38,650*	3.5
Chemical	39,750	37,350	6.4
Computer	39,650	n/a	—
Aerospace	38,900	36,900	5.4
Design consulting and engineering	38,550	36,800	4.8
Construction	38,000	37,200	2.2
Lumber and wood products	38,000	38,650*	−1.7
Local government	37,400	32,250	16.0
Electronic equipment	36,250	33,300	8.9
Metal industries	35,950	32,700	9.9
Electric	35,050	34,400	1.9
Mechanical	34,300	34,900	−1.7
State government	30,500	28,750	6.1
Federal government	29,900	38,150	−21.6
Average	**37,850**	**36,600**	**3.4**

*Figures for the paper industry and forest products industry were combined in the 1983 survey. The 1984 survey treats the two industries as two separate categories.

Source: Engineering Manpower Commission.

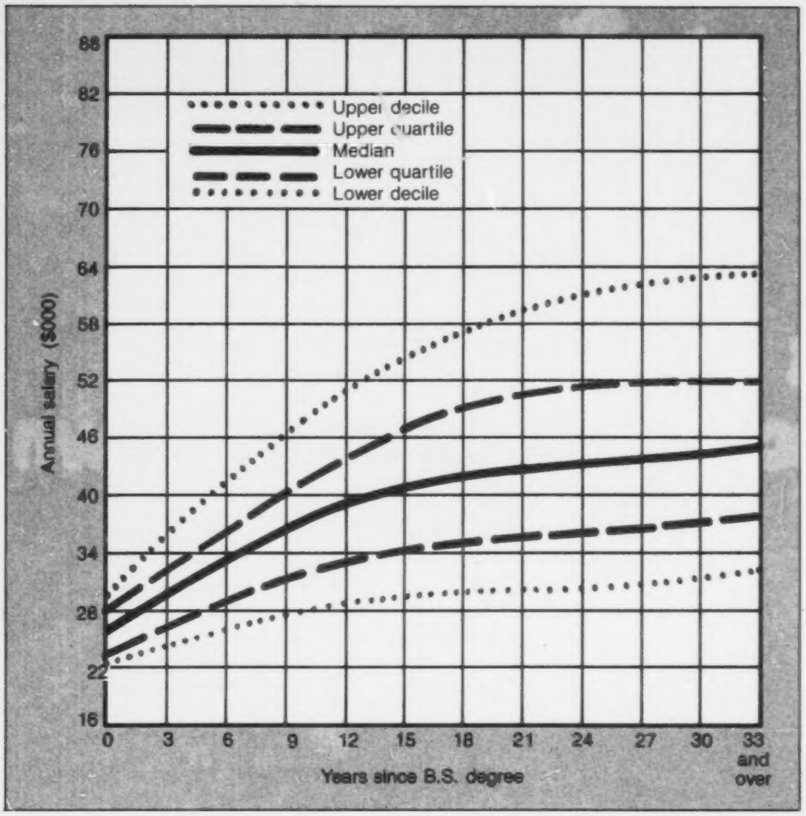


FIGURE 2: **Annual salary of engineers in all industries since B.S. degree.**

outpaced by 4.6% inflation in 1984

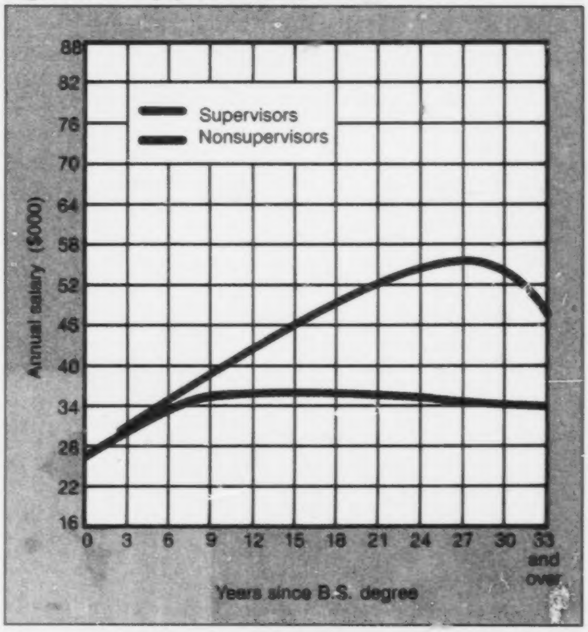
lor of science degree. For comparison, annual salaries of all industry engineers are plotted in Figure 2. In 1984, newly employed engineers in the paper industry earned a starting salary ranging from $23,950 to $31,050, with a median starting salary of $27,000.

Although experience affects salaries, annual compounded rates decrease as experience increases. Higher percentage increases go to less experienced engineers, resulting in salary compression between starting and experienced engineers. This is true for engineers in all industries (Figure 2) as well as for those in the paper industry (Figure 1). It is especially true for those in nonsupervisory positions (Figure 3).

Differences in salary exist for many reasons other than years of experience, and these factors must also be taken into account. For example, data on all engineering categories show that engineers in supervisory positions earned considerably more than those in nonsupervisory positions. In the paper industry, median salaries paid to supervisory engineers average out to $43,100, while median salaries paid to nonsupervisory engineers average out to 33,800.

Salaries also fluctuate with geographic region. The difference between median salaries paid (for all engineers) in the west-south-central region, where salaries are the highest ($41,350), and the east-north-central and south-Atlantic regions, where median salaries are the lowest ($36,900 for both) is $4,450, compared to a spread of $8,650 between the high and low regions in 1983. ■

FIGURE 3: **Median salaries of supervisory vs nonsupervisory engineers in the paper industries, 1984.**



Complete salary data are published in *Professional Income of Engineers—1984*, from the Engineering Manpower Commission of American Assn. of Engineering Societies, 345 East 47th St., N.Y., N.Y. 10017. Price: $45 for members; $75 for nonmembers.

Slow capacity growth should keep

But uncertainties include impact of the strong dollar on exports, plastic invasion of the grocery sack market, and customers' new quality needs

By WILLARD E. MIES, Executive News Editor

■ Despite recent market weakness, the U.S. linerboard and corrugating medium market should be relatively tight over the next couple of years because of limited capacity growth, according to several speakers at the First International Unbleached Kraft Conference.

But some concerns expressed by speakers at the meeting, sponsored by *Pulp & Paper* and *Pulp & Paper International* last November in New York City, included the continuing impact of the strong U.S. dollar on liner exports, the plastic invasion of the kraft grocery sack market, and faster than expected incremental capacity growth caused by installation of high-intensity presses and other improvements in technology.

New market requirements facing the industry were also discussed, including the need for lower-cost containerboard and boxes, improved compression strength, and better quality graphics. But some disagreement still existed over box specifications in the proposed alternate to Rule 41, which tries to incorporate some of these changing market needs.

LIMITED NEW CAPACITY. The most striking factor about the U.S. linerboard market outlook is the very limited additions to new capacity which are projected through 1987, said Thomas P. Clephane, a principal in Morgan Stanley & Co. Inc. While long-term capacity growth since the mid-1960s has been between 3% and 3.5% annually, the latest American Paper Institute survey shows capacity additions rising at only a 1.2% annual rate for the 1982-87 period.

A number of major linerboard expansion projects have been deferred or postponed due to recent low profitability in the industry, decisions by certain companies to buy assets rather than build, and the collapse of profits from timber and wood products, he noted.

With the limited capacity growth, Clephane looks for relatively high linerboard operating rates over the next two years and improving industry profitability. He projected linerboard demand would rise 1.2% in 1985 and 3% next year based on about 2% growth in box shipments each year. He forecast linerboard export shipments would rise about 5% in 1985, followed by a 7% increase in 1986.

This would result in an industry operating rate of 96.5% in 1985, rising to 98.2% in 1986 (Table 1). "It is unlikely that we could produce a set of circumstances, outside of a very deep recession, that would drop the operating rate over the next two years to under 94%," he noted.

Corrugating medium should also be in relatively tight supply over the next two years, according to Clark S. Johnson, executive vice president, Virginia Fibre Corp. He cited forecasts by Copeland Economics showing corrugated box shipments rising by 3.3% in 1985 and then declining by 3.5% in 1986 as the economy enters a recession.

He noted that Copeland is forecasting semichemical medium production of 5.28 million tons this year, which would be up about 2.5% from last year, followed by a 2.9% decline to 5.13 million tons in 1986. This would result in operating rates of 101% in 1985, followed by a slight decline in 1986.

Clark predicted that medium is "destined to play an increasingly important role in providing the needed top-to-bottom compression of a corrugated box. This will probably come from heavier weights of medium as linerboard facing weights decrease."

GREENFIELD VS INCREMENTAL EXPANSION. The cost of building a greenfield linerboard mill vs upgrading an existing mill was discussed by Ron Aurell, president, Jaakko Pöyry International Inc. and Richard L. Trueb, president of Pöyry-Bek Inc.

Trueb estimated that the average capital cost for building a new state-of-the-art 350,000-tpy linerboard mill is currently about $275,000/daily ton. This is lower than the cost in the late 1970s and early 1980s due to the impact of new technology, recent competitive pricing for equipment and construction, and the fact that the estimate is for a less than super-scale mill.

An accumulation of recent small technological innovations offer "attractive, and to a major extent, untapped productivity gains and cost reduction opportunities not only in older mills but in mills built more recently," Trueb noted. These include high-intensity pressing, improvements in pulp mill energy economics, and methods to de-bottleneck and extend recovery cycle capacities. He presented several examples of incremental expansion projects at existing mills of various

liner market tight

ages ranging in cost from $108,000 to $165,000/daily ton. The return on such modernization projects is attractive in the current economic environment.

Trueb speculated that several 300,000-tpy-size linerboard mills may be built in the U.S. South in the late 1980s by either independent firms or European producers. Some of the "super-mill" plans postponed by major U.S. integrated producers may be "dusted off" and implemented in the early 1990s, he commented.

Financial strategies for companies thinking about building new mills or acquiring existing assets were discussed by Donald P. Brennan, managing director of Morgan Stanley & Co. Inc. and a former industry executive. He noted that during the 1978-83 period, capital spending by the forest products industry had "significantly outweighed" the industry's ability to generate cash.

This has caused forest products companies to turn heavily to capital markets, particularly debt financing. Debt has been a costly financing alternative because of the "unprecedented" level of real interest rates in recent years, he noted. With the difference between inflation and interest rates currently about 8% to 9% vs only about 2% in 1978, financial decisions are crucially important for a company's success.

Forest products firms have also been increasingly turning to merger and acquisition activity as a source of external financing. Total financing activity during the 1978-84 period equaled $20.7 billion, of which mergers and acquisitions represented $14.7 billion, debt $3.8 billion, and equity $2.2 billion. Most of the equity activity ($1.1 billion) took place during the 1983 stock market surge, he said.

CHANGING QUALITY REQUIREMENTS. A number of economic, marketplace, and regulatory forces are changing future performance requirements for containerboard and boxes, according to Victor A. Casebolt, vice president and group executive, International Paper Co. Some of the major quality trends noted by Casebolt and other speakers are as follows.

- Containers are being stacked higher and higher on pallets in warehouses and this is creating a need for boxes with greater top-to-bottom compression strength. At the same time, a shift from metal cans and glass bottles to flexible plastic in primary packaging is placing greater demand on corrugated containers for stacking strength. Cole Rowland, vice president of Phillip Townsend Associates, a Houston, Texas-based consulting firm, described how a shift to plastic in motor oil and paint packaging has placed new demands on corrugated.

One response of manufacturers has been to develop new high-strength boards using stronger medium and lighter-weight linerboard to produce boxes with greater stacking strength, Casebolt said. International Paper has introduced a board (HercuCorr) which uses thermosetting polymers to achieve greater strength and moisture resistance.

- Higher-quality graphics are being required for corrugated containers for use in point-of-purchase displays. One survey found that 21% of container plant managers are using color coating and more than 50% said they would be likely to use preprinted linerboard in several years, Casebolt noted.
- Cost pressures at the converting level are creating the need for new technology such as the continuous-run corrugators. Such corrugators, which can run at speeds up to 820 to 1,000 fpm (compared with around 650 fpm previously) are creating the need for higher-performance containerboard.

According to James F. Stevenson, president of SAS International Inc., a consulting firm based in Cincinnati, Ohio, higher speeds have affected containerboard quality requirements in three major areas: (1) moisture uniformity requirements have tightened as higher speeds have reduced the moisture changing capacity of the corrugator; (2) tolerance to mechanical defects in roll quality that can cause web breaks is reduced; (3) bonding of liners to medium must take place faster.

He said that a couple of major integrated U.S. companies have already made substantial progress toward achieving moisture uniformity, and a significant number of U.S. mills would have the necessary technology by late 1985 or early 1986. While there is no universal industry standard, an 8% moisture level is best for both boxmaker and paper mill, according to Stevenson.

- Containerboard represents about half the cost of making a box, and the need to reduce cost is resulting in the increased use of secondary fiber, hardwood furnish, and lower basis weights. Although there are no new mills being built to use virgin fiber, Temple-Inland is building a recycled liner mill in Ontario, Calif., and In-

TABLE 1: **U.S. linerboard industry forecast, 1983-88, (000 short tons) (Source: Morgan Stanley & Co.)**

	1983	1984e	1985e	1986e
Production	15,001	15,950	16,135	16,615
% change	11.17	6.33	1.16	2.97
Exports	2,255	2,150	2,250	2,400
% change	19.57	−4.66	4.65	6.67
Production for U.S.	12,746	13,800	13,885	14,215
% change	9.80	8.27	0.62	2.38
Inventory change	−117	40	−150	−100
U.S. consumption	12,863	13,760	14,035	14,315
% change	9.87	6.97	2.00	2.00
Box shipments				
% change	7.4	7.0	2.0	2.0
Real GNP				
% change	3.7	6.8	2.9	2.5
Federal Reserve Board production index				
% change	6.6	10.9	3.4	2.5
Capacity*	16,217	16,488	16,723	16,914
% change	1.15	1.67	1.43	1.14
Operating rate (%)	92.50	96.74	96.48	98.23

*Based on American Paper Institute November 1984 survey. e=Estimate.

ternational Paper Co. has acquired an idle recycled containerboard mill in Riegelsville, Pa., Casebolt noted. He said the capital cost for a new recycled mill is only about 60% that of a virgin mill.

Stevenson noted that outside the U.S., most inside liner and much of the corrugating medium are made from 100% recycled fiber. Although about 60% of the containerboard consumed in the U.S. is kraft, nonintegrated European box plants appear to be using kraft for only about 25% of their containerboard requirements.

He also noted a trend—most advanced in parts of the world where fiber costs are high—to reduce combined board basis weight. "It's common in the U.S. to use 121 lb of fiber/1,000 ft² for applications successfully packaged and shipped in Europe with 94 lb/1,000 ft²."

DISAGREEMENT ON RULE 41. Reductions in basis weight in the U.S. are restricted by Rule 41 and Item 222 governing box specifications for rail and truck shipment. The speakers disagreed on the current proposed changes to these rules.

"The alternate Rule 41 is no longer a dream of the future but is ready to go today," said William O. Kroeschell, director of product technology, Stone Container Corp. Permits have been granted for the use of the alternate rule by the National Motor Freight Classification Board. The Uniform Freight Classification Committee of the Railroads has said that it will issue permits to any shipper requesting them for test shipments under the proposed rule, he noted.

The moves "legitimize" a trend in the market toward increased emphasis on compression to increase box stacking strength, Kroeschell said. Among other things, the alternate rule would use edge crush values for the first time to measure the compression strength of corrugated, reduce bursting strength requirements to 80% of their previous level, and make a few minor changes in the gross weight limits of some containers.

The alternate rule does not specifically change the weight of facings. In the future, however, the rules may be changed so that basis weight requirements would be eliminated and measurements placed on a performance basis, he said in response to a question.

"Edge crush is a powerful measure of the quality of liner and medium," Kroeschell stated. "Accompanying improved compression will be an improvement in the properties of linerboard determined by good fiber bonding, such as printability, resistance to score cracking and scuffing, and strong glued joints and closures."

Casebolt charged that the proposed changes are not market-driven but only serve the perceived needs of producers to reduce cost. While the logic behind the edge crush test is sound, he said the specifications for it have been set so low "that almost any box produced in the U.S. today can meet the specifications easily." Not only would bursting strength be reduced by 20%, but stacking strength would be lowered by 17% to 25%. "Therefore, what is proposed is lower performance, not higher," he said.

TABLE 2: **Supply/demand for liner in western Europe, 1982-1986—mottled included. (000 metric tons) (Source: ASSI Kraftliner.)**

	1982	1983	1984*	1985*	1986*
Corrugated board production	9,740	10,010	10,410	10,830	10,610
Kraft liner share (%)	27.0	27.0	26.5	26.0	26.0
Kraft liner consumption	2,630	2,700	2,760	2,820	2,760
Inventory change (estimate)	−70	+80	+50	−100	−50
Kraft liner apparent consumption	2,560	2,780	2,810	2,720	2,710
Kraft liner domestic supply	1,780	1,830	1,960	1,990	2,020
Import requirements to western Europe	780	950	850	730	690

*Forecast.

INNOVATIVE NEW MACHINE. Chesapeake Corp. is installing the first high-speed fourdrinier machine in North America to use multi-ply forming technology in the production of linerboard, according to Garland Edmonds, vice president, production. The machine, scheduled to start up later this year, is designed to achieve higher board uniformity and quality while permitting greater flexibility in the use of fiber furnish.

The 3,000-fpm Voith Duoformer K machine will be capable of running at 3,000 fpm and initially will produce 900 tpd of liner (from 26 to 90 lb/1,000 ft²), with provision for expansion to 1,200 tpd incorporated in the original design. The entire process from stock preparation through roll finishing will be computerized using the latest distributed control technology, Edmonds noted.

The machine design includes three individually formed plies using four wires, a highly loaded Bi-Nip press, and a third wide-nip Flex-O-Nip press capable of 6,000 pli. The three-ply sheet provides the ability to independently form and control the properties of each sheet.

Some advantages of this approach include improved formation, high fines retention, good ply bond and printability, better control of fiber orientation and basis weight, and the ability to choose the furnish for each ply. Tensile, burst, and ring crush test for the three-ply sheet should be significantly higher than for a single-ply sheet, Edmonds said.

LINERBOARD EXPORT OUTLOOK. U.S. linerboard exports showed a slight decline in 1984 because of the strong dollar, higher returns for producers in the domestic market, and slower economic growth in most overseas markets, according to Leo Schenker, executive vice president of Central National-Gottesman Inc. Exports declined from about 2.1 million short tons in 1983 to slightly more than 2.0 million tons in 1984 but should then rebound to nearly 2.2 million tons this year.

While exports to Europe, Latin America, Africa, and the Middle East will remain relatively stable or increase slightly over the next few years, Schenker expects a "very substantial" increase in U.S. shipments to the Pacific Rim. The share of U.S. kraft liner exports taken by Pacific Rim countries is expected to rise from 13% in 1978 to more than 35% by this year. In comparison, western Europe is expected to take only about 30% of total U.S. liner exports in 1985.

Scandinavian and European mills are shipping most of their kraft linerboard production into western Europe, where they have a current cost advantage over U.S. producers. In addition, the production of recycled containerboard within the EEC countries has increased from 5.2 million metric tons in 1983 to 6.3 million tons in 1984. "This means that whatever is left after usage of test liner and western European kraft liner has to be shared by the U.S., Canada, eastern Europe, and a number of new producers like Brazil and South Africa," Schenker said.

European per capita consumption of corrugated board is only about half that of the U.S., even in countries where income is roughly comparable, noted Bengt Hamrefors, general manager and CEO of ASSI Kraftliner in Sweden. This is due to a different distribution system in Europe, shorter shipping distances, higher cost of corrugated, and less-stringent freight rules.

For some of the same reasons, there has been a "very clear tendency" away from virgin materials like kraft liner and semichemical medium to recycled fiber in Europe, Hamrefors said. Kraft linerboard's share has declined from 28.0% of the western European corrugated board market in 1982 to an estimated 26.5% in 1984 and may drop to about 26.0% in 1985-86.

European box shipments are projected by ASSI to rise close to 4% in both 1984 and 1985 before declining to about 2% in 1986. Linerboard consumption will show somewhat slower growth because of the increasing share of the market taken by recycled board. Scandinavian and European producers will capture a larger share of the available kraft liner market, with import requirements declining each year from 950,000 metric tons in 1983 to an estimated 850,000 tons in 1984 and then to 690,000 tons in 1986 (Table 2).

LOW-COST PRODUCER. The strong rise in the dollar has dramatically changed the cost-competitive position of southern U.S. and Swedish kraft linerboard producers over the past two to three years, according to Fred D. Iannazzi, president, Andover International Associates, a Danver, Mass.-based consulting firm.

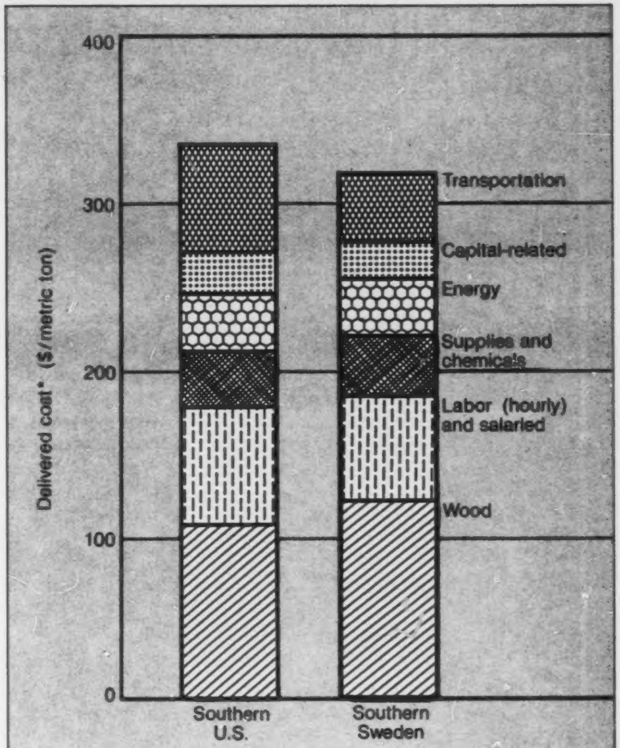
"In 1981, the U.S. South was the low-cost producer and supplier of linerboard to the European market," he noted. "Higher distribution costs partially reduced some of the U.S. cost advantage, but our significantly lower pulpwood costs more than compensated for Sweden's lower distribution cost in reaching European markets."

But between the latter part of 1980 and November 1984, the Swedish krona has lost about half of its value against the U.S. dollar. The impact of this dramatic shift in exchange rates can be seen in comparative pulpwood costs in the U.S. South and Sweden. In 1980, the U.S. South had a cost advantage of $69/metric ton of pulpwood, but this advantage had deteriorated to zero by May 1984. "Since then, Swedish pulpwood producers raised their prices by 20% last August, and the South has regained a slight cost advantage, but it is significantly less than in the past," Iannazzi said (Figure 1).

FUTURE OF CANADIAN INDUSTRY. The future of the Canadian containerboard and kraft paper industry in a declining tariff environment was discussed by Paul R. Bannerman, president of Etcan Ltd., a Montreal, Que.-based paper sales agency.

Until 1980, a 15% tariff wall protected the containerboard and kraft paper industry in Canada and selling prices reflected this tariff protection. Under GATT negotiations completed in the late 1970s, the Canadian government and a "somewhat reluctant industry" agreed to stage reductions in these tariffs, he noted. By 1987, unbleached kraft paper will have no duty protection, kraft liner will have only 6.5% protection, and corrugating medium a 4% tariff.

FIGURE 1: **Cost comparison for kraft linerboard, third quarter 1984. (Exchange rate = 8.1 Swedish krona per U.S. dollar.) (Source: Andover International Associates.)**



* Delivered to northern European port but excluding interest charges and sales commission.

These reductions have been "extremely painful" for the Canadian industry since its cost structure is not competitive with that of U.S. producers due to longer growing cycles and higher wood harvesting costs. In addition, most mills in eastern Canada were designed to serve the smaller Canadian market and were not built on an economic scale, he noted.

Bannerman said he doubted that another kraft linerboard mill would be built in Canada and that there may well be some shrinkage of existing capacity over the next decade. Whatever capacity is added will be recycled, which currently accounts for about slightly more than 50% of Canada's liner capacity vs only about 2% in the U.S. He predicted that Canadian liner output would grow at a 2% annual rate for the remainder of the 1980s vs 2.9% for the previous decade, which in turn was only half the rate of the 1960s.

KRAFT PAPER MARKET SHRINKING. The reshaping of the unbleached kraft paper industry that began in the late 1970s will continue, marked by further machine conversions, shutdowns, and acquisitions, according to Thomas Ryan, conference cochairman and kraft industry consultant based in Westwood, N.J.

The kraft grocery bag and sack market has grown into the single largest end use for unbleached kraft paper at about 2.2 million tons in 1984. Manufacturing kraft grocery paper and converted bags, however, has been a low-margin business due to the concentrated buying power of major supermarket chains and the tendency of linerboard mills to swing production into this market in periods of weak demand. There is also increasing competition from plastic bags due to improvements in resin technology and converting methods "which have placed plastic on a toe-to-toe basis with kraft paper economics," Ryan said.

Multiwall is the second largest unbleached kraft paper market at about 880,000 tons in 1984 but is first in the hearts of paper mill managers, according to Ryan. This is mainly due to its higher price, which reflects higher specifications, smaller runs, a wider range of roll widths, and small shipment size. Bulk handling systems have been the largest factor reducing multiwall's market share but should be less of a competitive factor in the future, he said.

COMPETITION FROM PLASTICS. Competition in unbleached kraft paper markets from polyethylene will increase significantly over the next 12 or 18 months, according to Robert E. Bauman, principal, Chem Systems Inc., Tarrytown, N.Y.

Among factors which have increased competition from polyethylene have been the introduction of such new film resins as linear low-density polyethylene (LLDPE) and high-molecular-weight, high-density polyethylene (HMW-HDPE), which permit down-gauging plastic sacks.

The polyethylene industry also suffers from oversupply, which is aggravated by growing exports from feedstock-rich countries such as Canada and Saudi Arabia. Significant new capacity is starting up in Saudi Arabia and Canada in the first quarter of this year. This has contributed to downward pressure on polyethylene prices, with prices for most resins below their 1979-80 level, according to Bauman.

Faced with poor profitability and fairly mature markets, polyethylene producers and fabricators view unbleached kraft markets as an attractive growth area. LDPE and HDPE have already made significant inroads into the retail merchandise bag market. Now the major battlefield is the grocery carryout sack market, which could consume upward of 750 million lb of polyethylene annually if 100% substitution were achieved.

In response to questions, Bauman estimated plastic penetration of the grocery sack market at 8% in 1983, rising to about 10% in 1984, and then to 40% by 1990. Ryan, however, estimated recent penetration at about 6% from an estimated 55 to 65 installed bag lines.

An example of how plastic is invading kraft paper markets was provided by Sharon McDermott, a buyer for J.C. Penney, who said that in 1973 the giant retailer used only paper merchandise bags amounting to about 11,000 tons. By the end of 1984, however, plastic will have accounted for 40% to 45% of Penney's bag requirements, depending on the region. ■

[Editors note: A book containing the complete proceedings from the Unbleached Kraft Conference will soon be available from Pulp & Paper's Book Dept., 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881.]

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On Reader Service Card **Circle 163**

RECYCLING: More suppliers meeting individual mill specifications

By MICHAEL DUCEY, Technical Editor

Consumption. A great deal of wastepaper consumers do not use chemicals, particularly those who produce products with no color specifications. Chemicals used in secondary fiber processing are many and vary with the system employed (see Table 1). Surfactants and dispersants have not been represented since many vendors and formulators sell various types and blends of both.

TABLE 1: **1984 consumption of chemicals for the recycled papermaking industry (short tons), as well as current list prices.**

Chemical	Recycling process	All pulp & paper	All industries	1985 price ($/short ton)
Caustic	12,220	2,000,000	11,600,000	$150[1]
Sodium silicate	11,421	12,500	750,000	296[2]
Sodium carbonate	11,750	200,000	8,465,000	120[3]
Hydrogen peroxide	5,000	17,000	137,000	465[4]
Sodium peroxide	5,000	5,000		

1. Liquid, 50%, seller's tanks, Gulf Coast works, f.o.b., freight equalized, 76% Na_2O.
2. Solid or glass, 3.22–3.25 ratio, bulk, 100-lb bags.
3. Dense, 58%, 100-lb bags, f.o.b. works.
4. 35% solution, tanks, freight equalized.

TABLE 2: **Available pulping additives used in recycled papermaking.**

	Phases available	Concentration	Shipped form
Caustic	Liquid	50%	Tanks
	Liquid	73%	Tanks
	Flake	76%	400-lb drum
	Solid	76%	700-lb drum
	Granular	76%	450-lb drum
	Bead	76%	400-lb drum
Chemical action: (1) Adjusts pH and maintains alkalinity. (2) Alkali reacts to saponify the varnish of ink and remove rosin-sizing from fibers.			
Sodium silicate[1]	Solid	3.25	Bulk, 100-lb bags
	Solid	3.25	100-lb bags
	Solid	1.95-2.0	Bulk, 100-lb bags
	Solid	1.95-2.0	100-lb bags
	Liquid	3.22-3.25	55-gal drum
Chemical action: (1) Substitution for caustic and effective at lower pH. (2) Prevents yellowing in deinking of groundwood pulps.			
Sodium metasilicate	Anhydrated	50%	100-lb bags
	Anhydrated	50%	Bulk, 100-lb bags
	Pentanhydrated	20%	100-lb bags
	Pentanhydrated	20%	Bulk, 100-lb bags
Chemical action: (1) Substitution for caustic and effective at lower pH. (2) Prevents yellowing in deinking of groundwood pulps.			
Hydrogen peroxide[2]	Liquid	35%	Tanks
	Liquid	50%	Tankcar
	Liquid	70%	Tankcar
Chemical action: (1) Used to bleach as well as deink (with silicate). (2) Decreases brightness reversion.			
Surfactants			
Nonionic detergent	Liquid	30-100%	55-gal drum
Ionic detergent	Liquid	30-100%	55-gal drum
Dispersants	Liquid	40-100%	55-gal drum
Chemical action: (1) Detergents aid in wetting pigment in inks. (2) Dispersants prevent agglomeration of pigments after separation from fiber.			

1. Ratio of percent SiO_2/percent Na_2O.
2. Similar to sodium peroxide.

The washing/deinking process calls for the addition of chemicals at a repulper. Consuming the greatest amount of chemicals are high deinking grades (colored/uncolored ledger), and the least consuming grades are white shavings, envelope cuttings and other white paper made from chemical pulp. All processes use some chemical to maintain alkalinity to fiberize and separate ink from fiber. Caustic soda is commonly combined with chemicals such as sodium peroxide, soda ash, hydrogen peroxide and/or sodium silicate. Blended surfactants that wet fibers and contaminants and that aid in dispersing are also added into the pulper. Common surfactants employed are nonionic and anionic detergents. Surfactants can be applied alone or are sometimes dissolved in solvent systems, such as aromatics (benzene and toluene derivatives, cetain napthas) and aliphatic hydrocarbons.

Prices. There is a trend developing among suppliers of providing mills with formulations specific to the site conditions (pulping equipment, effluent components, wastepaper grades used, etc.) One well-documented formulation involves low or antifoaming agents which break foam formation quickly, thus avoiding foam problems in the effluent treatment system. Others deal with "stickies," charge aversion, hard water and pitch control. These problem-solving additives are causing incremental price increases as formulators seek to replace cheap diluents like phosphates) with the more effective chemicals.

Surfactant/solvent blends are becoming less prevalent due to mounting environmental concerns of worker safety. These formulations decrease in price with increasing solvent content.

Caustic suppliers see stable prices through 1985, as the chloro-alkyl industry suppresses last year's oversupply scare. Only peroxide capacity seems to be increasing this year as other major producers have not announced any large expansion. It should be noted that producers of surfactants and dispersants often offer many different products and new formulations that generally cost around $1/lb (±$0.25/lb depending on diluent and other additives). ■

NOTE

ONLY THE FOLLOWING PAGES OF THIS

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PULP & PAPER

April 1985

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(Photo courtesy of Voith GmbH.)

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Office locations

AT — Atlanta: 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339; (404) 432-3186; Telex 275015
SF — San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273
NY — New York: 370 Lexington Ave., New York, N.Y. 10017; (212) 683-9294; Telex 220442
BR — Brussels: Chaussée de Charleroi 123a, Boite 5, B-1060, Brussels, Belgium; Telex 046-24672

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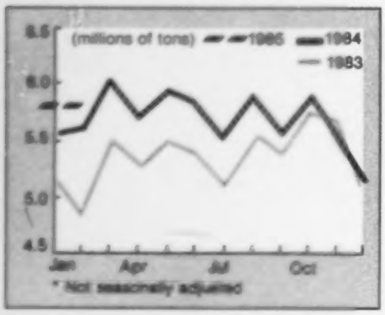

U.S. paper and board production

January production got the year off to a solid but undramatic start, rising 1.7% compared with January 1984, according to the American Paper Institute. In contrast, production jumped 6.8% in January 1984 over 1983 levels. Production for January 1985 totaled 5.6 million tons, up 1.7% from 1984, for an annual rate of 69.1 million tons, also up 1.7% year-to-year. Reflecting the flatter production trend, the two-month average of seasonally adjusted data for December and January was up just 1.0% over 1984.

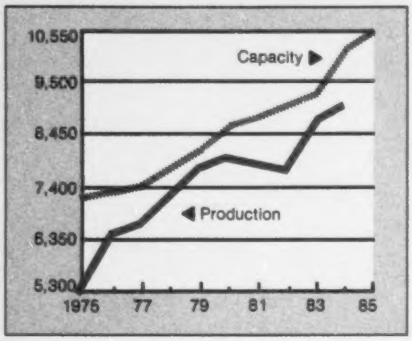
Among major grades, coated papers continued to lead the way, rising 11.6% on an annualized basis compared with January 1983, while uncoated free sheet climbed 2.1%. Uncoated groundwood was off 9.3% from last year, however, and packaging papers declined 4.0%. Bleached board also strengthened, rising 5.1%. Kraft paperboard was up 4.0%, but containerboard inventories jumped 15.6%, according to the Fibre Box Assn.

Canadian newsprint shipments totaled 739,000 metric tons in January, up 5.7% compared with 1984, said the Canadian Pulp & Paper Assn. Operating rates reached a strong 96% for the month, up from 93% in December. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Jan.	469	2.2	5,622	2.0
Uncoated groundwood (s)	Jan.	122	−2.4	1,469	−9.3
Coated paper (s)	Jan.	556	11.6	6,672	9.5
Uncoated free sheet (s)	Jan.	794	7.7	9,533	2.1
Other printing/writing	Jan.	118	−3.3	1,410	−3.4
Total packaging and other paper (s)	Jan.	456	−5.2	5,466	−4.0
Tissue	Jan.	403	−1.7	4,837	−.8
Total paper	**Jan.**	**2,917**	**3.0**	**35,009**	**1.5**
Unbleached kraft paperboard	Jan.	1,408	4.1	16,894	4.1
Semichemical medium	Jan.	417	−3.2	4,998	−3.4
Bleached paperboard	Jan.	338	5.6	4,054	5.1
Recycled paperboard	Jan.	682	1.8	8,184	1.9
Total paperboard	**Jan.**	**2,844**	**2.6**	**34,130**	**1.8**
Total U.S. paper and paperboard output	**Jan.**	**5,762**	**2.8**	**69,139**	**1.7**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Dec.	4,350	5.5	55,579	5.8
Market pulp production	Dec.	540	13.7	6,834	5.5
Wastepaper consumption at paper/board mills	Dec.	1,208	4.4	15,889	8.1
Pulpwood consumption (cords)	Dec.	6,875	2.0	87,646	2.6
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft^2)	Jan.	23.137	5.7	23.127†	4.8
Containerboard inventories at U.S. box plants and mills	Jan. 1	2,822	15.6		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Dec.	817	5.4	10,576	24.3
Imports of Canadian newsprint	Dec.	625	7.2	7,681†	12.2
U.S. paper exports (including products)	Dec.	301	−16.4	4,309	−4.3
Exports of unbleached kraft linerboard	Jan.	110	−28.6	1,322	−28.6
Exports of woodpulp	Dec.	311	−19.0	3,594	−1.4
Norscan pulp inventories [4]	Jan. 31	1,781	38.2		
Norscan pulp operating rates [4]	Jan.	89%	89%	96%	93%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Jan.	739	5.7	739†	5.7
Operating rates	Jan.	96%	93%	96%	93%
Inventories held by U.S. consumers	Jan. 31	1,408	14.3		
Other paper/board shipments	Jan.	250	6.8	250	6.8
Woodpulp shipments (export only)	Jan.	538	−5.9	538†	−5.9
Operating rates	Jan.	87%	91%	87%	91%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1983	1984	1985e
Production[1]	8,767	9,150	9,585
Capacity[1]	9,354	10,083	10,559
Utilization rate	93.7%	90.7%	90.8%
Imports[2]	236	495	450
Exports[2]	59	65	70
Apparent U.S. consumption	8,944	9,580	9,965
lb/capita	76.6	81.4	83.8
GNP ratio	5.82	5.85	5.88

1. American Paper Institute data.
2. Commerce Dept. data.
e = Estimate.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Champion Intl.	922	8.7
2. Boise Cascade	800	7.6
3. International Paper	800	7.6
4. Great Northern	765	7.2
5. Union Camp	760	7.2
6. Hammermill Paper	649	6.1
7. Weyerhaeuser	565	5.4
8. Georgia-Pacific	545	5.2
9. Crown Zellerbach	443	4.2
10. Simpson Paper	355	3.4

Market share of top five companies:
38.3%

Market share of top ten companies:
62.5%

Total U.S. capacity (1985):
10.559 million short tons

UNCOATED PRINTING/WRITING FREE-SHEET PAPERS: Mixed year ahead as demand lags new supply

Grade structure: Uncoated free-sheet papers contain no more than 10% mechanical pulp with the balance being chemical woodpulp. Excluded are uncoated groundwood, cotton fiber, bristols, and thin papers. Major end uses include office papers (such as bond, forms bond, xerographic, tablet, and envelope), printing papers (offset, cover, and text) and miscellaneous (such as technical, papeterie, or colored school).

Production/capacity: Records were broken for the second year in a row in 1984, with production rising by 4.4% to a new high. However, at the same time, capacity had grown by 7.8% under the influence of new machines started up in 1983 by Champion International Corp. and in 1984 by Crown Zellerbach Corp. and Union Camp Corp. Also adding to capacity were a rebuild by Georgia-Pacific Corp. in 1984 and, even more significantly, the appearance of 529,000 tons of capacity in 1984 that mills were able to add through incremental expansions, over and above previously announced plans.

This sharp uptick in capacity drove the operating rate for the industry down by three points despite a 7.1% rise in apparent consumption. Capacity is expected to rise a further 4.7% in 1985, including rebuilds at International Paper Co.'s Mobile, Ala., mill, adding 350,000 tpy that is being converted from kraft papers and newsprint.

Outlook: With capacity rising by 4.7%, demand seems unlikely to increase enough to boost operating rates in 1985. Indeed, if the industry's trade balance does not improve somewhat, due to a weaker dollar or stronger demand overseas, operating rates this year will probably fall below 90%. This is despite the fact that demand should set a new record this year.

The industry enjoyed a strong year in 1984 in terms of shipments, and some end uses seem headed for another healthy performance. Many observers are expecting the book publishing segment, for example, to continue a comeback that began in 1983 from the depressed levels of the start of the decade. But it will be difficult for U.S. mills to match the kind of growth rates they are estimated to have recorded in 1984: 8.7% in forms bond, 8.6% in roll offset and 6.9% in white envelope, for example. On the other hand, copy paper shipments should do at least as well as the 3% growth rate of 1984.

Barring a miracle, none of this will mean any relief in pricing. Import volumes are thought likely to average a little lower than 1984 levels this year, with the decline showing up mostly in the second half, but overcapacity should keep prices depressed through the year.

Pricing: The industry pushed too hard for increases in 1983 and found itself unable to get through a mid-1984 hike. Prices slowly began to unravel immediately afterward and, in the case of 50-lb roll offset, January 1985 transaction levels were about 25% below year-earlier numbers. In the first quarter of 1985, mills were hoping the bottom had been reached, although the collapse of market pulp prices was a worrisome sign.

Two important grades are indicative of pricing trends. Prices shown are year-end, $/short ton, list quotes except where transaction prices are considerably below list, when transaction averages are shown.

Book paper, No. 3 offset, 45-lb sheets—1975, $484; 1976, $506; 1977, $548 to $555; 1978, $645; 1979, $711 to $717; 1980, $785 to $813; 1981, $878; 1982, $680; 1983, $840; 1984, $840. Forms bond, 15-lb rolls: 1975, $495 to $504; 1976, $520; 1977, $450 to $500; 1978, $538 to $550; 1979, $620; 1980, $643 to $697; 1981, $753; 1982, $640; 1983, $745; 1984, $680.

Markets: Estimated shipments by end uses are: bond, mimeograph, duplicating, xerographic—23%; forms bond—21%; offset printing—26%; envelope—11%; tablet—3%; other—16%. ■

(News section continued on page 23)

EXPANSION

Scott slates second coated machine at mill

Scott Paper Co. plans to install a second 215,000-tpy coated free-sheet machine at the Skowhegan, Maine, mill of its S.D. Warren Div., at a cost of $220 million. The new unit is scheduled for startup in the fourth quarter of 1986.

Chairman and CEO Philip E. Lippincott described the new machine as a "duplicate" of the existing unit which started up in 1982. The mill manufactures the lightweight Somerset line of web offset papers, generally in the 45- to 60-lb basis weight range. The new machine will make the same products.

The Somerset grades have generally been sold to the catalog, newspaper insert, book, specialty magazine, and direct mail businesses, the company said. The Scott announcement noted that "construction of the second machine will double lightweight capacity, making Scott a major factor in a market that we expect to produce excellent growth rates through this decade and beyond."

The construction and now the expansion of the Skowhegan mill was part of Scott's plan to shift premium coated grades to Muskegon, Mich., with medium-weight grades going to Mobile, Ala., and specialties to Westbrook, Maine.

Strong market predicted. Scott is known to be very bullish on the future of the coated free-sheet paper business as a whole, believing that operating rates will remain at 95% or above for the balance of the decade. Aside from enhancing its position in a big growth market, a further advantage of the second machine is that it will take an estimated 400 tpd out of Scott's market pulp sales, reducing exposure to a depressed pulp market.

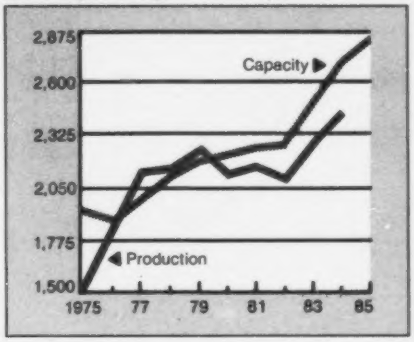
Other companies are also looking at new coated free-sheet capacity. Union Camp Corp.'s chairman and CEO, Peter J. McLaughlin, recently told an investment group in San Francisco, Calif., that his company continues to study entering the coated paper field. Options include adding a coated paper machine at its new Eastover, S.C., mill, adding an offline coater at its Franklin, Va., uncoated free-sheet mill, or an acquisition.

And Morgan Stanley & Co. analysts Thomas Clephane and Jeanne Carroll wrote recently that Champion International Corp. may announce installation of a coater at its Courtland, Ala., mill to increase capacity by 140,000 tpy. Startup of the coater would be in 1987, and the project would cost $50 to $75 million. The analysts are assuming that Champion will put off startup of a new coated groundwood machine until 1988. ■

Coated free-sheet expansion projects underway or under consideration. (Source: *P&P Project Report*).

Year	Company, mill	Capacity (000 tpy)	Project
1985	Consolidated Papers, Wisconsin Rapids, Wis.	25	Major rebuild of No. 12 machine.
1986	Scott Paper, S.D. Warren, Skowhegan, Maine	215	New machine
1987	Champion International, Courtland, Ala.	140	Considering new coater, analysts report
None	Midtec Paper, Kimberly Wis.	—	New machine under study
None	Union Camp, Franklin, Va., or Eastover, S.C.	—	Studying market entry via new off-machine coater at Franklin or new machine at Eastover
None	Westvaco, unspecified mill	150–300	Decision on new 150,000-tpy machine expected this year; a second such machine is also reportedly under study

Supply and demand for coated free sheet, 1975–85 (000 tons).



Canada to consider Domtar project aid

Canadian Prime Minister Brian Mulroney said he will consider government aid for Domtar Inc.'s proposed C$883-million modernization project at its Windsor, Que., mill, despite concern over possible U.S. reaction to such government assistance.

The prime minister's statement followed a decision in mid-February by Industry Minister Sinclair Stevens to reject a request from Domtar for a C$100-million grant for the project. Stevens' decision prompted Domtar to halt work on a major expansion of its white paper mill.

The government of Quebec, which owns 45% of Domtar, agreed to provide C$83 million toward the project, provided Domtar received the federal grant. Mulroney indicated, however, that the federal government wasn't prepared to make an outright C$100-million grant to the venture, but may provide an interest-free loan for a smaller amount.

In a statement explaining Ottawa's initial rejection of the grant, Stevens said the Canadian Pulp & Paper Assn. recently asked for reduced government intervention in the industry. He noted that producers feel that "federal support of this nature to a single company would have a negative effect on other companies through unfair competition and destabilization of the Canadian market." ■

SALES/EARNINGS

Canadian industry profits show further gains, but margins still low in West

Financial reports of Canadian pulp and paper companies showed continued improvement in the fourth quarter, although profit margins remained under pressure due to weakness in pulp and lumber prices. Results from a dozen firms show that aggregate sales were up 14% to C$3 billion, while earnings (excluding major nonrecurring items) more than tripled to C$106 million from a year earlier.

Full-year 1984 aggregate income of C$300.5 million reflected an even greater improvement from a year ago, despite the fact that profit margins of many western companies remained paper-thin and two major British Columbia producers still posted losses (although less than they had experienced in 1983). Sales of C$12.6 billion in 1984 were up 14.5% from 1983. Canadian companies continued to benefit from the weakness of the Canadian dollar in relation to the U.S. dollar but suffered from the strength of the Canadian dollar relative to most other currencies.

Lumber and pulp woes. MacMillan Bloedel Ltd. reported a nearly 600% increase in 1984 earnings compared with 1983's net, which was a very comfortable improvement over the C$93.3-million loss in 1982. Even so, MB (like other western producers) was adversely affected by industry-wide work stoppage in British Columbia and lower lumber prices, as well as by oversupply in the bleached softwood kraft pulp market, which caused prices to weaken in the second half. Increases in newsprint demand and prices were helpful.

British Columbia Forest Products Ltd., another western producer, reported that its 1984 sales surpassed C$1 billion for the first time and that fourth-quarter earnings were the best in three years. Strong demand and stable prices for newsprint and coated paper (from its U.S. Blandin Paper Co. subsidiary) helped to offset weaker markets for pulp and wood products.

Canfor Corp., another British Columbia company with heavy dependence on pulp and lumber, reported a fourth-quarter loss of C$12.2 million and a full-year loss of C$28.3 million. This followed losses of C$45 million in 1983 and C$85.7 million in 1982.

Eastern results stronger. Companies in eastern Canada on the whole showed a stronger profit performance for the fourth quarter and full year. Abitibi-Price Inc. reported 1984 sales of C$2.1 billion, up 29% from 1983, and earnings of C$72 million, up 90%. Robert Gimlin, chairman and CEO, said the earnings increase was a combination of the higher volume of newsprint sales, mills' cost-control programs, and better contributions from the fine paper and groundwood paper operations. The increased earnings also reflected the major benefits of capital projects that were largely brought online in 1983.

Domtar Inc. reported a 1984 net income of C$94 million, an increase of 134% over 1983, and said its fine paper business continues to be the main contributor to overall profits. Domtar added that better realizations were experienced for groundwood specialties and newsprint.

Great Lakes Forest Products Ltd. had 1984 sales of C$602 million—a record high. Softening markets late in the year produced some price erosion for both kraft pulp and fine papers. The newsprint market improved and permitted a modest price rise at mid-year. But the building products market was depressed for most of 1984. Net income was C$18 million; in 1983, the firm lost C$10 million.

Consolidated-Bathurst Inc. posted earnings of C$74 million, constituting a 114% rise over 1983; sales of C$1.6 billion were up 17%. The earnings increase was due to improvements in bleached pulp, groundwood specialties, and linerboard. Gains were partially offset by operating losses at the Bridgewater Div. in the U.K., higher depreciation, and interest expense.

Spectacular gains. The company with the most spectacular gains in 1984 is unquestionably Cascades Inc., which reports a tripling in both sales and earnings for the year. Important contributors to growth were the boxboard/kraft mills at Jonquière and East Angus, Que., acquired by Cascades in 1983. This year looks promising, a company spokesman said. Cascades is considering acquiring the Cartonneries Maurice Franck boxboard plant in France. ■

Canadian paper industry results.

	Full year (C$000)			
Paper companies	**Sales 1984**	**Change 1984/83**	**Earnings[1] 1984**	**Change 1984/83**
Abitibi	$ 2,137,169	28.7%	$ 72,326[2]	90.3%
B.C. Forest Products	1,014,700	12.8	9,200	n.m.
Canfor	1,029,500	3.5	(28,300)	n.m.
Cascades Inc.	180,000	190.3	12,596	202.4
Consolidated-Bathurst	1,622,984	16.5	73,806[2]	113.7
Crestbrook Forest Ind.	137,944	9.1	981	n.m.
Crown Forest	740,800	1.9	(4,900)[2]	n.m.
Domtar	2,040,000	12.1	93,900[2]	133.6
Donohue	438,600	22.5	30,300	222.3
Fraser Inc.	529,500	21.5	3,480	−109.1
Great Lakes	601,976	21.6	17,779	n.m.
MacMillan Bloedel	2,130,000	4.4	19,300	−589.3
Total	**$12,603,173**	**14.4%**	**$300,470**	**918.6%**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. **Abitibi:** 1984 net excludes C$162,000 net gain in 4th quarter, $2.19 million charge in year for sales of facilities. **Consolidated-Bathurst:** 1984 net excludes C$35.6 million writedown of Sulpetro investment, $18.5 million gain on sale of shares, $2.3 million gain on insurance claim. **Crown Forest:** 4th quarter and 1984 net exclude C$2.9 million gain in timber trade, downsized loss. **Domtar:** 4th quarter and 1984 net exclude loss for sold or closed facilities, tax loss.
( ) = loss. n.m. = Not meaningful.

Pulp and paper industry safety performance improves in U.S. South

The incidence of injury and illness in southern paper industry operations fell to 0.03448 last year from 1983's 0.04098 incidence rate, according to the Southern Pulp & Paper Safety Assn. (Table 1). The SP&PSA incidence rate is an expression of the total number of injuries and lost workdays in a mill, divided by the total hours worked by the employees.

For pulp and paper mills in the 2-million-employee-hour category, International Paper Co.'s mill in Natchez, Miss., had the lowest illness and injury rate in 1984, with a SP&PSA rate of zero. Buckeye Cellulose Corp.'s Memphis, Tenn., pulp and paper mill had the lowest rate for mills between 1 and 2 million employee hours. For mills that logged less than 1 million hours, Mead Paperboard's Stevenson, Ala., mill had the best safety record.

The association also keeps safety records for bag, box, and can converting, specialty products, plywood and sawmills, and woodlands operations.

Overall, the safety record of southern mills has improved during the past five years, with the 1984 index showing a decline after having been up somewhat in 1983. This trend has been attributed to many causes: dedication, persistence, and professionalism on the part of safety managers being among the most important. These managers are responsibile for keeping top management aware of unsafe conditions and encouraging employees to practice safe work habits.

Improved safety trends have also been attributed to the existence of an association such as SP&PSA, which provides a forum for exchanging ideas among safety personnel from mills throughout the U.S. South. The association also gives awards for mills with good safety records. Competition of this type between mills has proved to be a successful incentive toward improved safety records.

Another primary reason for improved safety trends in the past few years has been increased acceptance and recognition by mill management of the importance of safety. Management at many mills now realizes that safety is as much a key element in competitive mill operations as accounting, quality control, and keeping pace with technological developments. Focusing on safety and safety problems has resulted in net savings at year-end when compared with illness and injury costs, including lost time and workers' compensation, according to SP&PSA spokesmen.

PACIFIC REGION RESULTS. The Pacific Coast Assn. of Pulp & Paper Manufacturers' injury incidence rate showed an improvement over 1983 only in Washington State, with California, Oregon, and other western states recording poorer safety performances (Table 2).

Simpson Paper Co.'s Anderson, Calif., mill had the lowest incidence of injury/illness last year.

Of the eight Pacific Coast companies with multiple plant operations, ITT Rayonier Inc., Simpson Paper Co., Georgia-Pacific Corp., and Publishers Paper Co. showed improved safety performance. ■

TABLE 1: **Southern Pulp & Paper Safety Assn.'s injury and illness incidence report comparison, 1980-84.**

	1980	1981	1982	1983	1984
Pulp & paper mills (1)	.03865	.03151	.02696	.02746	.01974
Pulp & paper mills (2)	.12774	.09269	.06649	.06228	.05453
Pulp & paper mills (3)	.09310	.04617	.06201	.07610	.05019
Bag converting	.01409	.08196	.08301	.12532	.09090
Box & can converting	.05580	.08152	.06157	.08693	.02682
Specialty products	—	—	.03173	.01144	.01592
Woodlands (1)	.03805	.02978	.02352	.01845	.01822
Woodlands (2)	.09767	.03375	.03326	.01812	.01988
Plywood & sawmills	—	—	.07966	.03969	.04896
Industry overall	**.05826**	**.04787**	**.04183**	**.04098**	**.03448**
Fatalities	15	23	10	11	6
Approximate total number of employees				97,049	100,082

TABLE 2: **Pacific Coast Assn. of Pulp & Paper Manufacturers injury and illness report by state, 1984.**

				Incidence rate	
State	No. of mills	Hours worked	Recordable cases	Current period	1983 period
California	12	7,729,216	197	5.09	5.02
Washington	16	20,049,282	537	5.35	5.70
Other states*	4	3,653,381	113	6.18	5.41
Oregon	12	10.637,690	360	6.76	6.05
Total all mills	**44**	**42,069,589**	**1,207**	**5.73**	**5.64**

*Other states include Alaska, Montana, and Arizona.

"Safety Notes" is a new page in* Pulp & Paper *highlighting pulp and paper mill safety. Industry safety statistics will be covered on a quarterly basis, and during the interim months, news about successful safety programs at various mills will be featured. "Safety Notes" will include news about people, new ideas, successful incentive programs, and awards given by mills for safety achievements. Please send any information (including photos when applicable) about your mill that you feel would be appropriate to this section to: Susan Taylor, Departments Editor,* Pulp & Paper,*2700 Cumberland Parkway, Suite 530, Atlanta, Ga. 30339; or call (404) 432-3186.

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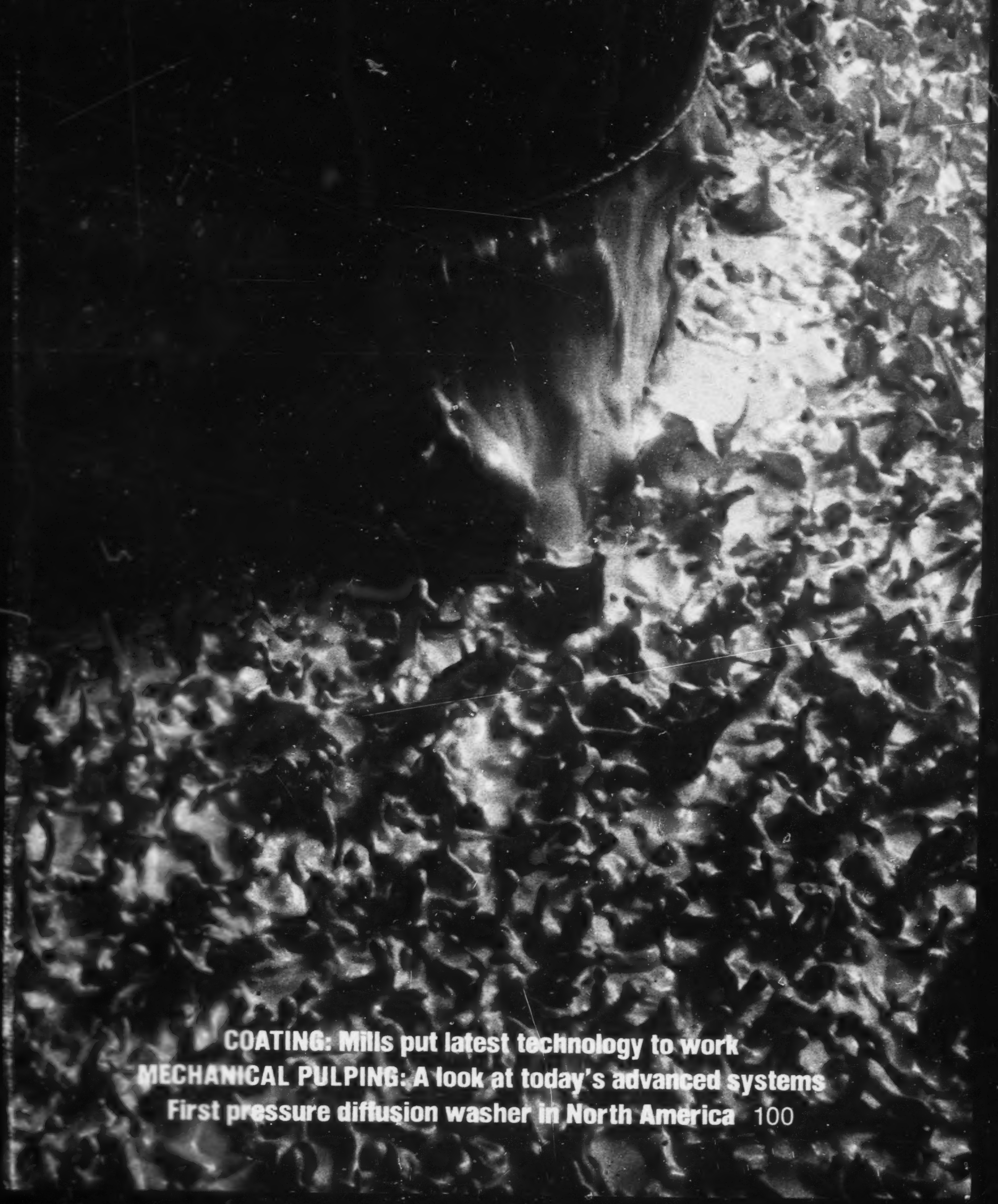
May 1985



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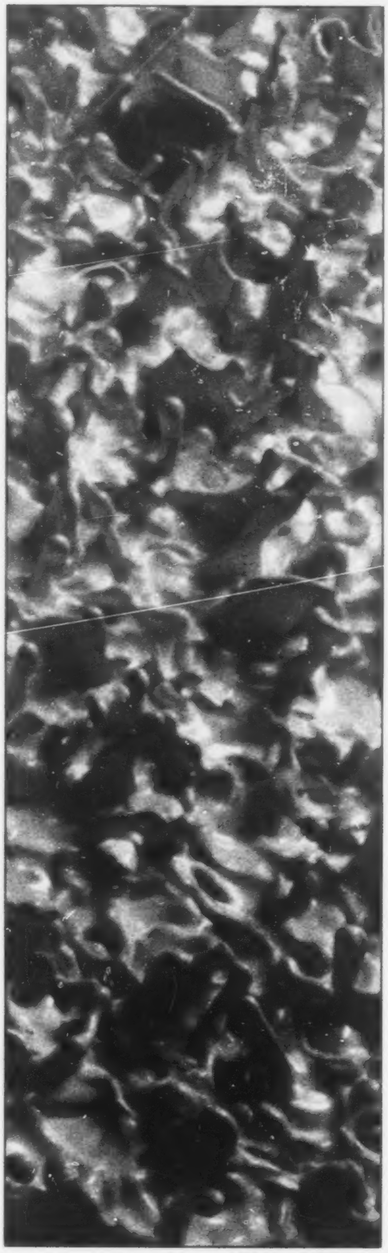

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Office locations

AT — Atlanta: 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339; (404) 432-3186, Telex 275015
SF — San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273
NY — New York: 370 Lexington Ave., New York, N.Y. 10017; (212) 683-9294; Telex 220442
BR — Brussels: Chaussée de Charleroi 123a, Boite 5, B-1060, Brussels, Belgium; Telex 846-24672

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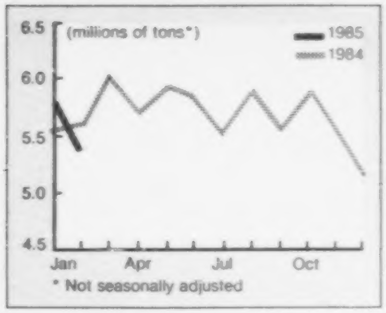
MONTH IN STATISTICS

U.S. paper and board production



February production of paper and paperboard in the U.S. totaled 5.4 million tons, down 4.2% from February 1984, for an annual rate of 66.9 million tons, down 1.5% compared with last year, according to American Paper Institute data. Part of the 4.2% drop was due to an extra day last February because of the leap year, however. Paper production in February dropped 0.2% on an annualized basis, to 34.2 million tons, while paperboard production was off 2.8%, to 32.7 million tons. The two-month moving average of seasonally adjusted data for January and February showed a slight increase of 0.9% over last year's record pace, indicating that production is holding steady at high levels.

Among major grades, coated paper and tissue were the only grades up compared with last year. Coated paper rose 3.8% and tissue 1.9%. Groundwood papers, down 7.3%, and packaging grades, down 6.5%, suffered the sharpest drops, while newsprint and uncoated free sheet were flat. All of the paperboard grades were down 2% to 3%. Containerboard inventories in February dipped 2.4% compared with the previous month, reported the Fibre Box Assn.

Canadian newsprint shipments climbed 9.8% in February, to 709,000 metric tons, said the Canadian Pulp & Paper Assn. Operating rates continued very strong, reaching 97% in February, up from 96% the previous month.

	Latest month	(000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Feb.	447	−1.1	5,495	.5
Uncoated groundwood (s)	Feb.	119	−7.0	1,466	−7.3
Coated paper (s)	Feb.	498	−2.2	6,354	3.8
Uncoated free sheet (s)	Feb.	751	2.0	9,271	.4
Other printing/writing	Feb.	116	.9	1,411	3.3
Total packaging and other paper (s)	Feb.	434	−11.1	5,337	−6.5
Tissue	Feb.	397	3.1	4,882	1.9
Total paper	**Feb.**	**2,762**	**−1.8**	**34,216**	**−.2**
Unbleached kraft paperboard	Feb.	1,282	−8.3	16,125	−2.4
Semichemical medium	Feb.	400	−2.7	4,902	−2.8
Bleached paperboard	Feb.	319	−6.2	3,881	−2.2
Recycled paperboard	Feb.	611	−6.0	7,783	−3.1
Total paperboard	**Feb.**	**2,611**	**−6.7**	**32,691**	**−2.8**
Total U.S. paper and paperboard output	**Feb.**	**5,373**	**−4.2**	**66,907**	**−1.5**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Jan.	4,595	1.7	55,139	2.1
Market pulp production	Jan.	579	9.0	6,949	5.0
Wastepaper consumption at paper/board mills	Jan.	1,321	2.2	15,857	2.3
Pulpwood consumption (cords)	Jan.	7,413	3.2	86,956	4.6
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Feb.	20,337	7.1	43,464†	−1.3
Containerboard inventories at U.S. box plants and mills	Feb. 1	2,894	−2.4		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Jan.	896	4.2	10,749	4.2
Imports of Canadian newsprint	Jan.	634	−2.5	7,604†	−2.5
U.S. paper exports (including products)	Jan.	341	1.8	4,089	1.7
Exports of unbleached kraft linerboard	Feb.	117	−23.0	1,361	−25.9
Exports of woodpulp	Jan.	301	15.8	3,610	15.9
Norscan pulp inventories[4]	Feb. 28	1,882	6.2		
Norscan pulp operating rates[4]	Feb.	96%	90%	89%	96%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Feb.	709	9.8	1,448†	7.7
Operating rates	Feb.	97%	79%	97%	86%
Inventories held by U.S. consumers	Feb. 28	1,500	19.2		
Other paper/board shipments	Feb.	247	19.9	499	13.2
Woodpulp shipments (export only)	Feb.	487	2.3	1,010†	−3.5
Operating rates	Feb.	94%	89%	62%	77%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

COATED GROUNDWOOD PAPER: No slowdown in sight yet—this year looks promising

Grade structure:
Coated groundwood papers have a basestock made from furnish containing at least 10% mechanical pulp. The balance consists of chemical pulp and fillers. About 85% of U.S. coated groundwood falls into the No. 5 coated sector, representing the bottom of the coated paper quality spectrum, while the balance is considered to be No. 4 coated.

No. 4 has superior appearance characteristics, including a higher brightness rating, while No. 5 is valued for runability and lighter basis weight.

Most coated groundwood is made in the 32- to 50-lb range (25 x 38 in. in reams of 500), although some 30-lb paper is made and the group can run up to 70 lb. End-uses include magazines, Sunday supplements, catalogs, newspaper inserts, directories and other books, fliers and other commercial printing. In the case of lightweight coated (LWC) paper, coat weight may be up to 30% of total sheet weight.

Production/capacity:
Last year was a banner year for U.S. coated groundwood mills, with production rising 8.6% despite a 153% explosion of imports. Coated groundwood was considered to be in an extreme shortage situation all year long, although demand growth appeared to slow down toward the end of the year.

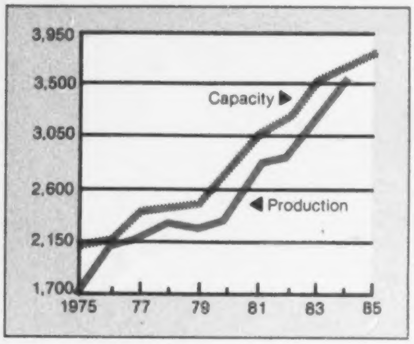
Almost no new capacity was expected to come onstream during this year, although American Paper Institute officials said at their annual Paper Week meeting in New York City in March that their capacity estimate for the year might have to be bumped up by 4% if production continues at levels comparable to those of early 1985.

Outlook:
Demand is expected to remain strong this year although not growing as rapidly as in recent years, when apparent consumption jumped by 31% (1982-84). Limited capacity availability will constrain growth somewhat, although the sponge capacity that API officials warned about could permit greater growth than that which is presently forecast. Slower economic growth is expected to produce more modest increases in paper consumption, however, and high import levels should drop off as the year goes on. Markets should be in rough balance between producers and consumers for most of the year, although extreme tightness could return late in the year if a recession is not looming at that time.

Prices:
Prices rose in January 1984, July 1984, and January 1985, but seem unlikely to go up again in 1985. Typical pricing trends ($/short ton for 34-lb roto paper, year-end except 1985, which is second quarter) are: 1973, $285; 1974, $400; 1975, $399; 1976, $460; 1977, $533; 1978, $582; 1979, $671; 1980, $735; 1981, $760; 1982, $760; 1983, $782; 1984, $890; 1985, $931. Offset prices average about $10/ton higher.

Markets:
About 62% of all No. 5 goes to magazine publishers and another 17% goes to commercial printers, with a further 16% being shipped directly to catalog and directory printers. Other end-uses include books. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1983	1984	1985e
Production[1]	3,226	3,505	3,595
Capacity[2]	3,522	3,701	3,744
Utilization rate	91.6%	94.7%	96.0%
Imports	150	380	350
Exports	34	45	50
Apparent U.S. consumption	3,342	3,840	3,895
lb/capita	28.64	32.61	32.76
GNP ratio	2.17	2.35	2.31

1. P&P estimate.
2. API capacity survey.
e = Estimate.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Champion	630	16.8
2. International Paper	450	12.0
3. Consolidated	385	10.3
4. Boise Cascade	306	8.2
5. Mead	300	8.0
6. Crown Zellerbach	300	8.0
7. Blandin Paper	280	7.5
8. Midtec Paper	200	5.3
9. Pentair Industries	180	4.8
10. Weyerhaeuser	175	4.7

Market share of top five companies:
55.3%

Market share of top ten companies:
85.6%

Total U.S. capacity (1985):
3.744 million short tons

(News section continues on page 23)

would disperse some of their bargaining clout. Employers, though, are not sure whether it is more beneficial to bargain as a group or separately. They have expressed interest in meeting with the unions to discuss the options. PPIRB chairman and CEO Don Saunders said the industry will welcome the input of the two pulp and paper unions in considering future approaches to bargaining.

In its de-accreditation decision, the labor relations board said "the trade unions have described a number of serious potential results touching industrial stability and the process of collective bargaining in the industry which may flow from the de-accreditation of the bureau."

"The fact that negotiations of an acceptable substitute may fail is not sufficient ground to deny the bureau's application for cancellation of the accreditation," the board said. ■

Electrical workers reject James River offer

Negotiations at James River Corp.'s Halsey, Ore., mill broke down because the International Brotherhood of Electrical Workers voted to reject the most recent offer. United Paperworkers International Union employees at the mill had earlier ratified a three-year contract that followed the regional 0%/4%/4.5% pay hikes to occur over three years. No new meetings were scheduled, but the mill continues to operate.

- A new three-year contract containing no base wage increases was ratified by the Retail, Wholesale, & Department Store Workers Union at **Buckeye Cellulose Corp.**'s Memphis, Tenn., mill. Instead, workers each receive a $500 lump-sum payment in each of three years, with the contract expiring Mar. 8, 1988. In addition, workers each get a $500 bonus in the first year for quick action on a new agreement.
- Meanwhile, **Niagara of Wisconsin Paper Corp.** negotiated a two-year contract with members of the UPIU and office workers at the Niagara, Wis., mill. The agreement calls for pay hikes of 5.5%/5% over two years. The new contract will expire on Jan. 31, 1987. ■

Labor conflicts heat up in wood products mills

International Woodworkers of America struck four Weyerhaeuser Co. wood products plants in the U.S. South in late March, following rejection of a three-year contract offer that would have frozen wages for the first year and given each worker a $500 cash payment instead (*P&P*, Apr., p. 41). Plants on strike are Wright City, Okla.; and DeQueen, Mountain Pine, and Dierks, Ark.

In the Pacific Northwest, where Weyerhaeuser has asked wood products workers to accept pay and benefit cuts, officials of both the IWA and the Lumber Production & Industrial Workers union said their members oppose the idea.

At their annual meeting in March, LPIW delegates voted to "ride out the contract," said Jim Bledsoe, executive secretary of the union. Timber industry executives have "an attitude that there is an opportunity to roll back the clock, and the thrust of this convention was to prevent just that," he added.

"Economic blackmail by billion-dollar employers" is how IWA western regional president, Vernon "Red" Russell, described the Weyerhaeuser request. "We will not roll over in the face of blackmail. We will not reopen our contracts," he said after an IWA policy board meeting. Weyerhaeuser was "disappointed" at news of the IWA position, said Lee Bjorklund, company communications aid. ■

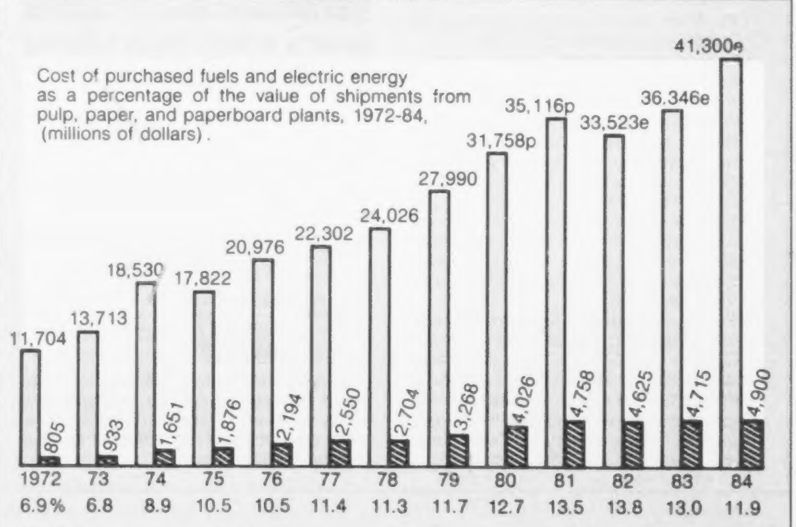
ENERGY

U.S. mills generated 55% of their energy in '84

The U.S. paper industry increased its use of self-generated and residue sources of energy from 40.8% of total energy used in 1972 to 55.2% in 1984, according to the American Paper Institute. This resulted in saving the annual equivalent of about 198 million barrels of oil, or about 44 days of current U.S. oil imports.

The industry since 1972 has also reduced its total oil consumption by 61%, its natural gas consumption by 20%, and total consumption of fossil fuels and purchased energy by nearly

The cost of purchased fuels and electric energy as a percentage of pulp, paper, and paperboard shipments has declined since 1982.



e = Estimate. p = Preliminary.
Source: Survey of Manufactures, Bureau of the Census. Cost of purchased fuels & electric energy estimated by API for 1982, 1983, and 1984.

16%. These reductions in total energy use were made despite a 32% increase in total pulp, paper, and paperboard output over the 12-year period. Average use of fossil fuels and purchased energy/ton of output declined 40% to 12.2 million Btus/ton in 1984 from 19.2 million in 1972, according to API's Energy & Materials Dept.

Based on the 1981 Census of Manufacturers, API has estimated that the industry's cost of purchased fuels and electric energy as a percentage of the value of its pulp, paper, and paperboard shipments rose from 6.9% in 1972 to 13.8% in 1982. It fell to 13.0% in 1983, and decreased further to 11.9% last year.

Some recent studies show that the pulp and paper industry is the leader in self-generation and cogeneration of electric power, accounting for about 50% of all cogeneration in the nation. About 37% of the industry's own electricity demand is cogenerated—an annual fuel savings equal to 22 million barrels of oil. ■

RECYCLED BOARD

Two recycling mills sold; Lawrence still reorganizing

Two recycled boxboard mills in the Northeast were sold in March, while a third recycled board company was scheduled to file a reorganization plan in April.

International Paper Co. completed the acquisition of Durham Mills Inc.'s 375-tpd recycled boxboard mill in Riegelsville, Pa., effective Mar. 7, for an unknown amount. The company said it did not know when the mill would resume operating. It has been shut down since June 1983. Some improvements are planned, but no details have been released.

New York wastepaper dealer **V. Ponte & Sons Inc.** will buy **Whippany Paper Board Co. Inc.**'s Clifton, N.J., 350-tpd recycled boxboard mill, subject to obtaining the necessary state and local operating permits.

A Whippany spokesman expects the sale to be closed within six months. Local officials are supportive of the mill's reopening, he said. Ponte could not be reached for comment.

With the sale of the Clifton mill, Whippany has only one asset—the Eden 1,000-tpd recycled paperboard mill in Whippany, N.J.—in the way of its Chapter 13 liquidation. Once that is sold, the company will be dissolved and any profits distributed to its stockholders. The company's creditors were all paid off at 29 cents/dollar in August of 1982, according to the spokesman.

- **Lawrence Paperboard Corp.** and its Harriman Paperboard Corp. and Lawrence Packaging Corp. subsidiaries are optimistic that a plan for reorganization to be filed with the U.S. Bankruptcy Court for the district of Massachusetts will satisfy its creditors, a company executive said. Lawrence filed Chapter 11 in March 1984 and was to file its reorganization plan in last month. ■

WOOD PRODUCTS

U.S. agency to reconsider Canadian lumber imports

Imports of Canadian lumber will get a second look from the U.S. International Trade Commission. The ITC accepted Reagan administration trade specialist William Brock's request to study the impact these imports have on U.S. producers. The ITC report is due July 8.

Congress is going ahead with its own solution to the problem. On Mar. 20, the House Interior Committee approved HR 1088, a bill which would limit Canadian imports to 20% to 25% of U.S. lumber sales (*P&P*, Apr., p. 39). This is the "historic average" level established during the 1970s before imports surged to claim about 30% of the market. And Rep. Don Bonker (D-Wash.) has introduced a bill which aims to speed up talks between the U.S. and Canada on the softwood trade issue. It would also offer incentives for Canada to voluntarily restrain lumber exports to the U.S.

Two years ago, a group of U.S. lumber producers claimed that Canada's stumpage policies are a subsidy for the lumber industry and asked for a tariff to counter the subsidy. But the ITC ruled then that Canada was not subsidizing its lumber industry and that the U.S. should not impose duties on lumber, which continues to enter the U.S. duty free.

Bonker, who is chairman of the House Foreign Affairs Subcommittee on International Economic Policy & Trade, said he would prefer a bilateral agreement to limit lumber imports to quotas, tariffs, or other U.S. actions. Bonker's bill would allow Canada and the U.S. to talk for a year in order to reach "a voluntary restraint agreement limiting imports of Canadian lumber, ending Canadian stumpage subsidies, and eliminating tariff and nontariff barriers to wood product trade on both sides." His bill would require the President to establish or raise tariffs on Canadian lumber, plywood, and other wood products. The bill would also change the definition of "subsidy" in the Trade Act to include government stumpage policies.

Scott Shotwell, vice president-congressional relations of the National Forest Products Assn., noted that lumber prices are so low in the U.S. that few wood products firms are showing profits. Canadian lumber is blamed for depressing prices despite strong demand for lumber, creating "serious economic conditions." Concern is growing over "the continued high level of Canadian lumber imports and its effect on the long-term health of the U.S. industry." ■

NONWOVENS

Colgate purchases P&G's Boundary line

Colgate-Palmolive Co. said its Kendall unit bought the Boundary line of disposable surgical drapes and gowns from Procter & Gamble Co. for an undisclosed amount.

Kendall will produce and market the Boundary line in addition to its own Curity line of surgical drapes and operating room gowns. The acquisition will include production equipment and other assets in Del Rio, Texas, and Acuna, Mexico, as well as patents and trademarks. The sale was effective Apr. 1. ■

U.S. pulp/paper demand expected to show

But some worry at API annual meeting over high inventories in certain grade segments and impact of strong dollar on U.S. exports and imports

P&P STAFF REPORT

■ Continued domestic economic growth, which is averaging close to 4%, should boost U.S. paper and paperboard production in 1985, according to most speakers at American Paper Institute's annual Paper Week meeting Mar. 11-13 at the Waldorf-Astoria Hotel, New York, N.Y. But higher-than-normal inventory levels in many grade segments, which were built up in the second half of last year, plus flagging U.S. exports and a rising tide of imports caused by the strong dollar were frequently mentioned sources of concern.

API president Louis F. Laun noted that paper and paperboard production for the first two months of 1985 was at a rate of 68 million tpy, close to the 68.7 million tons produced for all of 1984. "As the new year began, the heat of inventory demand was cooling, and consumers began to reassess their future needs." He said that the industry's performance was "in line with the trend in business activity" and noted that the economy is "moving into a maturing phase."

Consumption of paper in 1985 is expected to rise modestly, in line with the projected growth in real GNP of 3.7%, compared with 6.8% last year, Laun said. Packaging grades, however, could suffer from adverse trade trends caused by the strong dollar.

TABLE 1: **U.S. uncoated free-sheet paper shipments.**

Grade	1984 (000 tons)	1984 vs 1983 (% change)	Last half 1984 vs last half 1983 (% change)
Bond	2,046	+1.8	+1.8
Forms bond	1,898	+8.7	+3.3
Offset	2,319	+7.2	+3.6
All other	2,885	+1.4	−1.9
Total	**9,148**	**+4.3**	**+1.4**
U.S. coated paper shipments			
Groundwood	3,668	+9.5	n.a.
Free sheet	2,558	+9.0	n.a.
Total	**6,226**	**+9.3**	**+3.4**
New U.S. printing/writing paper supply (U.S. shipments + imports − exports)			
Uncoated free	9,542	+6.8	+2.7
Coated paper	6,569	+13.7	+8.5

Source: American Paper Institute.

Imports of paper and paperboard in 1984 amounted to a record 10.4 million tons, up 23.5% from 1983, while exports fell 4.5%. In the case of woodpulp, U.S. imports rose 9.7%, while exports slipped 1.4%. In all, the U.S. industry's trade deficit for paper and allied products, including wastepaper and other fibers, amounted to $2.9 billion in 1984, according to Laun.

WHITE PAPER OUTLOOK. Growth in U.S. printing and writing paper consumption this year should outstrip overall economic activity by a slight margin, API vice president James L. Hutchison told Printing-Writing Paper Div. members.

Hutchison reminded members that his year-earlier predictions for 1984 growth in U.S. shipments of coated paper and uncoated free sheet proved to be close to the mark, but a little on the low side. Coated paper shipments actually rose 9% and uncoated free-sheet shipments, 4.3%, compared with predictions of 8% and 4%.

"However, the sharp inroads of tonnage from overseas sources and the resultant substantial increases in end-user inventories early in the year were not expected," he added.

As the year went on and imports reached record levels, customer psychology shifted from one of stock accumulation to one of inventory liquidation. That, plus the fact that early 1984 represented a recovery period from recession levels, slowed down the growth rate of U.S. shipments. Comparing the second half of 1984 with the same period in 1983, the uptick in U.S. shipments fell to just 3.4% for coated paper and 1.4% for uncoated free-sheet (Table 1).

Growth was also unevenly spread within the printing/writing group. In uncoated free sheet, Hutchison estimates that U.S. forms bond shipments were up 8.7% last year and offset printing papers, 7%. Bond and writing grades, however, rose just 1.7%, as they had begun their recovery before the rest of the industry.

Coated paper shipment growth was more evenly distributed, with coated groundwood up 9.2% and coated free sheet up 9.5%.

Looking ahead, Hutchison uses a GNP increase of 3.7% this year and 2.7% next year as basic assumptions. Using that growth rate in 1985 and the continuation of historic ratios of consumption to GNP, he sees coated pa-

even further growth

per consumption up 5.5% this year and uncoated free sheet up 4.6%.

Helping U.S. shipments will be the likelihood that imports won't match last year's record levels. On the other hand, the inventory runup of early 1984 won't be repeated, which will retard shipment increases somewhat. Therefore, Hutchison expects to see U.S. printing and writing shipments up 2% to 4% this year.

As evidence of the present downtrend in U.S. imports, Hutchison noted that uncoated free-sheet imports hit a peak of 36,000 tons for the month in March 1984 and were down to just 7,100 tons in January 1985.

A worrisome sign for operating rates in the coated groundwood area was indicated by the recent operating performance of mills. Whereas API's most recent capacity survey would indicate coated groundwood capacity rising 1.2% this year, Hutchison noted that actual capacity increases could total 4% if early 1985 production levels are maintained. This phenomenon is similar to trends that earlier forced API to boost its 1984 coated paper capacity estimate by 320,000 tons from projections made before 1984 began.

SURGE IN NEWSPRINT DEMAND. Hutchison focused special attention on U.S. newsprint consumption in his remarks addressed to the Newsprint Div., noting that 1984 usage was up 8% over the previous year and 13% over 1982. Powering this increase particularly was a 17% jump in 1984 demand by end-users other than daily newspapers, in contrast with a 5% jump by dailies.

In the two-year 1982-to-1984 comparison, consumption due to other uses shot up 31% to 3.1 million metric tons, while daily newspaper use was up 8% at 8.3 million tons. The daily newspaper performance wasn't a bad one, however, contrasting as it did with average growth of just 1.5%/year in 1972 to 1982.

U.S. and Canadian shipments to different regions rose unevenly. Shipments to the U.S. South were up a "whopping" 12.8% in 1984. By contrast, shipments to the West rose 7.5% and to the North, 7.7%.

Canadian mills made some gains in 1984, pushing their shipments to the U.S. South up by 18%, while U.S. shipments to that region rose just 10.5%. But perhaps the most noteworthy change in shipment patterns occurred in the overseas import category, with shipments up from 59,100 tons in 1983 to 193,000 tons in 1984.

API's Paper Week luncheon speaker was J. Peter Grace (center), who is chairman and CEO of W.R. Grace & Co. and chairman of the President's Private Sector Survey on Cost Control (popularly known as the Grace Commission). He is flanked by Albert F. Duval, API chairman and chairman and CEO of Hammermill Paper Co. (left), and Louis F. Laun, API president.

API Pulp, Materials & Technology Group heard from (left to right) its vice president, Ronald J. Slinn; David Clark, executive director, European Paper Institute; and Bo Wergens, president, Swedish Pulp & Paper Assn.

DOLLAR TO REMAIN STRONG. U.S. economic performance should remain healthy this year, outshining much of the industrialized world, delegates to the annual meeting of API's Printing-Writing Div. were told. Unfortunately for the U.S. pulp and paper industry, delegates also heard that the dollar will remain strong through this year.

Thomas R. Robinson, manager of international economics for Merrill Lynch Economics, predicted that U.S. real GNP will rise by about 4% this year, compared with earlier consensus estimates of closer to 3.5%. By contrast, Europe will be expanding at a 2% to 3% clip, with only Japan growing at the faster pace of 4.5%. "That makes the U.S. look like a good performer, particularly when our growth, as Japan's, should be accompanied by employment and productivity growth," Robinson said.

Robinson also noted that "the U.S. has had a better balance between consumption and capital spending than any other nation, including Japan. That should continue this year as well."

The economist expects the U.S. inflation picture to get even better than the year-over-year 1984 performance. U.S. consumer prices rose just 1.8% in the last quarter, only half the year-over-year increase for 1984. And while U.S. inflation rates fell in late 1984, inflation was heating up abroad as the year ended.

The key issue seemed to be the strength of the dollar. Robinson pointed out that the trade-weighted value of U.S. currency is 90% higher than its July 1980 trough and 60% above where it was in 1973, when it was cut loose to float.

Robinson expects to see the dollar peak this year not far above DM3.50, averaging in the fourth quarter "no lower than about DM3.15 and ¥250." He added that "we have another hard year ahead for American exporters and businesses that compete with foreign producers."

Looking a little further down the road, Michael Galsworthy of U.K.-based Hawkins, Wright Associates forecasts average U.S. GNP growth rates of 2.7%/year for the 1984-1989 period, compared with actual increases in 1979-1984 of just 2.1%. By contrast, he believes the 13 countries of western Europe will see economic growth remain unchanged in the forecast period from previous levels, at 1.1%/year. And Galsworthy, like Robinson, believes the dollar will remain strong through 1985.

OVEREXPANSION IN EUROPE. Western Europe's pulp and paper industry can look forward to another year of respectable growth in 1985 if exports continue to soak up a large percentage of the Continent's output. On the other hand, the current capacity expansion boom in Europe could make this solid performance hard to sustain.

Particularly alarming was the estimate by Galsworthy that western Europe could have 4 million metric tons of printing and writing paper output available for export in 1988—nearly double the 2.2 million tons shipped outside the region in 1984.

Galsworthy's forecast assumes that apparent consumption of printing and writing papers in the 13 western European countries will be virtually stagnant between 1984 and 1988, edging down from 13.6 million tons last year to 13.0 million tons at the end of the forecast period. At the same time, he sees western Europe adding 1.7 million tons of capacity in that period, raising its capacity from 118% of apparent consumption in 1984 to 137% in 1988.

European Paper Institute executive director David A. Clark told the Pulp Materials & Technology Group that the "graphic grades" of paper—newsprint, uncoated groundwood, coated paper, and uncoated free sheet—will get 2.4 million tons of new capacity in Europe by 1987 (Table 2).

"This increase is equivalent to almost 11% of the exceptionally high level of European production in 1984, or five years of normal growth," Clark pointed out. (Galsworthy told his audience, along the same lines, that 1984 levels may not be sustainable and that some of that production probably went into inventory accumulation.)

Also sounding concerned, Clark noted that "for this increased capacity to be absorbed in a reasonable period of time without major market disruptions will require an exceptionally high and sustained growth in demand, both within Europe and for exports."

WILL EUROPE'S EXPORT BOOM LAST? Looking at 1985, Clark expressed cautious optimism. "As so often is the case in Europe, the answer seems to lie in the U.S., for both the economy as a whole and the paper industry in particular," he said. Within Europe itself, he pointed out, there is confidence that advertising and printing activity will remain strong at least through the first half of the year, buttressing uncoated groundwood and coated papers. But, he added, "there is less confidence about uncoated wood-free papers and certain packaging grades."

Assuming a continuation of present economic conditions, Clark believes "an increase of about 4% in 1985 [similar to the rate achieved in 1983] is certainly feasible for real demand for paper and board in Europe, at least in the first half."

This would be a dropoff from the sharp increases in production recorded last year, however. "The growth in paper and board production, especially in the graphic grades, can be described as spectacular," Clark noted. Among the growth rates for 1984: total paper and board production, 10%; newsprint, 17%; printing and writing grades, almost 13%, including coated paper, up more than 20% (although uncoated free sheet was up by less than 6%); supercalendered uncoated groundwood, more than 11%; and nongraphic grades, 6%.

Pushing output up was the pace of exports, particularly to the U.S. For the second year in a row, European exports to the U.S. doubled, reaching "well over a million tons in 1984" (Figure 1).

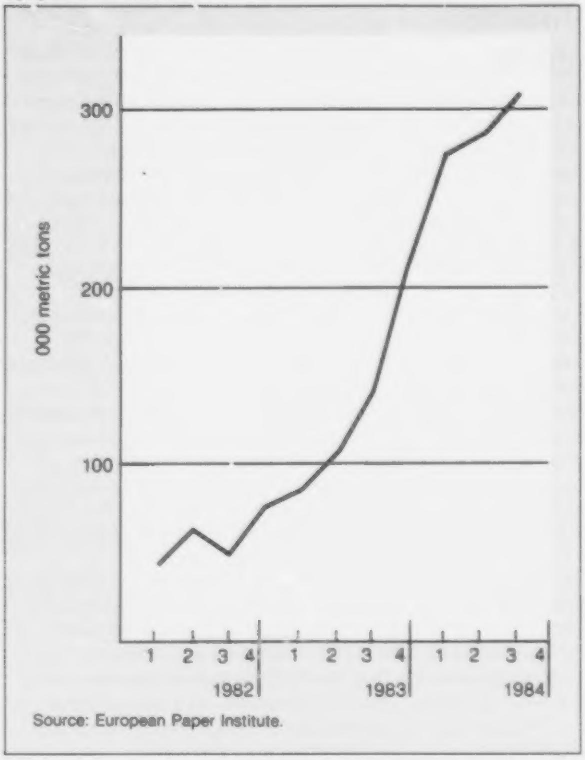
Galsworthy estimates western European printing and writing paper exports to North America in 1984 at 997,000 metric tons, constituting 46% of total European exports to points outside of the region. At this level,

TABLE 2: **European paper industry capacity increases and major projects, 1984-87.**

Grade	Number of projects	Increase (decrease) (000 metric tons)		Percent of 1984 production	Average annual growth in European demand (%)
Newsprint	6 (4)	960 (350)	610	10.1	1.0
Uncoated mechanical	6 (3)	425 (285)	140	2.9	1.0
Uncoated wood-free	10		565	10.5	2.5
Coated	12		1,088	17.8	3.5
Total	**34**		**2,403**	**10.8**	**2.0**

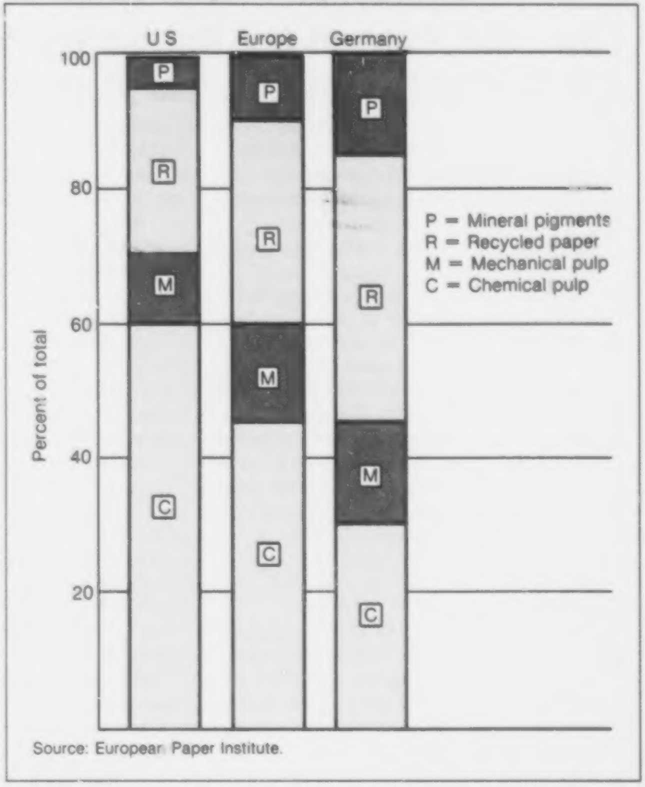
Source: European Paper Institute.

FIGURE 1: **European paper and board exports to the U.S. by quarters, 1982-84.**



Source: European Paper Institute.

FIGURE 2: **Papermaking materials (percent of total).**



Source: European Paper Institute.

North America is more than three times as important as the No. 2 destination, eastern Europe, with 293,000 tons of shipments from that region.

Western Europe has done very well in shipments to regions outside North America, of course. One reason for that success was shown by Galsworthy when he offered estimates on comparative transport costs for major supply regions shipping to major consuming areas. By his estimate, printing and writing papers shipped from Finland to the U.S. East Coast would cost $75/metric ton to ship, going in 500- to 1,000-ton lots in containers. A Rotterdam-U.S. East voyage would cost $65/ton. This would not be prohibitive for European mills, which already enjoy cost advantages over North American mills, due to the high value of the dollar.

But the comparison is even clearer with reference to the U.S. West Coast and Tokyo. Bound for the West Coast, Galsworthy estimates costs at $110/ton for shipments from Finland, $110 to $125 for shipments coming by rail from the Midwest or East Coast, and just $100 from Rotterdam. Shipments moving from Finland to Tokyo would cost only $90/ton, $15 lower than the same freight going from the U.S. West Coast to Tokyo.

ROUGH TIMES AHEAD FOR MARKET PULP? Assuming that Clark's projections about European and U.S. economic and paper industry activity are correct, market pulp producers are in for a rough period in the years ahead. He notes that three of the four new or converted uncoated free-sheet machines starting up in Europe this year will be integrated with pulp production. Furthermore, some coated groundwood business has probably gone to coated free sheet and will return to groundwood when capacity becomes available.

Other factors include the growth of thermomechanical and chemi-thermomechanical pulps (Clark estimates 400,000 metric tons of CTMP will be sold in Europe this year) and the increasing use of mineral fillers in uncoated free sheet. "Ten years ago, the average level of filler loading was 10% to 15%, with 20% as the practical maximum," Clark noted. "Today the average level of filler loading is above 20%, with 30% as the practical maximum" (Figure 2).

Clark also noted that "the growth of alkaline papermaking—which enables higher loading, especially of cheap locally available calcium carbonate, without loss of strength—has contributed to this development." He estimates that in 1984, 38% of uncoated free sheet made in Europe and 60% of coated free sheet was made under alkaline conditions.

And finally, Clark reminded the API audience that while the dependence on market pulp is dropping in Europe, world market pulp capacity is rising at a rapid pace.

SWEDEN AND THE EEC. Fears that Sweden would integrate forward into paper production and sharply cut back market pulp shipments to European papermakers have not been realized, according to Bo Wergens, president of the Swedish Pulp & Paper Assn.

Because of such concerns, tariffs were not removed on Swedish exports into the EEC until Jan. 1, 1984, after an 11-year period, compared with a five-year period for removal of tariffs on most other industrial goods. The extra time was designed to give the European paper industry time to restructure and become more economically competitive, he said.

But the pace of forward integration in Sweden has

PULP WHODUNIT

In "The Case of the Confusing Pulp Market" U.S. pulp industry is the principal victim

In "The Case of the Confusing Pulp Market," American Paper Institute vice president Ronald J. Slinn described the circumstances leading up to the current depressed state of the pulp market, identified the principal victim, and revealed the weapon. And like any good "pulp" magazine mystery writer, he named the villains of the story—or at least those who benefited most from the victim's injury.

First, he described some of the events leading up to the "crime" at API's Pulp, Materials & Technology Group meeting on Mar. 11. One such event was the nine-week British Columbian labor dispute that began in February 1984 and resulted in the loss of 750,000 metric tons of potential production of chemical paper-grade market pulp.

Although this loss represented only slightly more than 3% of world total potential production in 1984, pulp consumers began to build purchased pulp inventories. While timely world statistics are not available, API data show that U.S. consumers had built their pulp inventories to a record high of 621,000 tons at the end of April 1984—which is equivalent to 40 days of recent consumption, in contrast to a more normal level of 30 days.

On the other side of the inventory coin, North American and Nordic (Norscan) market pulp inventories dropped to 917,000 metric tons at the end of March 1984, their lowest level in 42 months. This represented 21 days of supply at rates of deliveries at that time, in contrast to a more normal 25 days of supply.

With the resolution of the British Columbian labor problem, relieved pulp consumers began to use up their purchased pulp inventories. In the case of U.S. consumers, inventories by the end of January were down to 427,000 metric tons, which represented 32 days of consumption—close to a normal level.

Circumstantial evidence. Meanwhile, producer inventories in all major producing countries have been growing at a rapid rate. U.S. producer inventories, for example, went through 500,000 metric tons for the first time ever at the end of November 1984. They then reached almost 650,000 metric tons at the end of February, representing 50 days of supply at the rate of U.S. shipments over the preceding three months. Total Norscan producer inventories by the end of February reached almost 1.9 million metric tons.

Despite the slowing of the U.S. economy in the third quarter of 1984, U.S. consumption of chemical paper-grade market pulp in 1984 reached a new all-time high of 5.3 million metric tons—up almost 10% over 1983. This was considerably more than the 7.6% increase in U.S. printing/writing paper production. The reason for the faster growth in market pulp consumption probably reflects fluff pulp, which has been showing rapid growth in recent years and is included in the statistics for paper-grade pulp, Slinn noted.

API estimates that annual U.S. consumption of diapers alone has reached the 16-billion-unit level and is growing at an annual rate of 7%. If each diaper contains 46 g of fluffing pulp, total U.S. diaper demand for pulp could be around 800,000 metric tons. Total U.S. demand for all fluff pulp applications would therefore be very close to 1 million metric tons, about half of which is met through market purchases.

More clues. "While the outlook for diaper-derived demand for fluffing pulp may be affected by the projected substitution of superabsorbent polymers, we are nevertheless faced with the realization that a large portion of the recent growth in U.S. chemical paper-grade market pulp demand, averaging 6.1% annually since 1975, has probably been in fluffing grades," Slinn said. "Consequently, the demand for truly paper-grade grades of chemical pulp may well have been growing at a quite modest rate."

Further support for a slower-than-apparent rate of U.S. growth in truly paper-grade grades of chemical pulp is the additional evidence of increased use of wastepaper in the tissue sector.

Another circumstance leading up to the current confused pulp market has been growth in world supply. Between 1983 and 1986, world capacity of chemical paper-grade market pulp is expected to expand by 1.8 million metric tons, or at an average annual rate of 2.1%. This capacity is being added in Austria, Brazil, Chile, Portugal, Czechoslovakia, South Africa, Finland, and Guatemala. But by far the largest portion of it—40%, or more than 700,000 metric tons—will be added in the U.S. "In 1986, U.S. capacity will exceed the combined Nordic total for the first time, having grown at an average annual rate of 4.2% since 1983," the API executive said.

Victim: U.S. producers. Although U.S. producers benefited from the short-lived opportunity to fill the supply gap created by the B.C. labor dispute, they are probably the major victims of the current market pulp downturn, according to Slinn.

For all of 1984, U.S. producers increased their share of world market pulp shipments by half a percentage point when deliveries to all markets from the major producing countries grew only 1% from 1983. "But U.S. producers suffered quite a blow in their domestic market, falling well below the 50% share of market pulp deliveries to the U.S. that they enjoyed in 1983 and 1982."

Canadian mills might also be included among the "wounded parties," except for their major increase in hardwood shipments to the U.S. market. Shipments of bleached hardwood sulfate market pulp to the U.S. have grown from slightly more than 900,000 metric tons in 1978 to 1.4 million metric tons in 1984, accounting for more than 27% of total chemical paper-grade market pulp deliveries in the U.S. last year.

Weapon: the strong dollar. U.S. producers supplied more than 80% of deliveries of bleached hardwood kraft market pulp in 1978 and 1979, and the Canadian producers, about 15%. In 1984, the U.S. producers' share of this market dropped to almost 60%, while the Canadian share rose to 26%. Brazil also has been capturing more of the U.S. hardwood pulp market, its share rising from 1% in 1978 to 10% in 1984.

More than any other factor, the damage inflicted on U.S. producers has been caused by "the unrelenting strength of the U.S. dollar," according to Slinn. He noted, however, that some might say the wound was self-inflicted because of the large U.S. industry capacity buildup.

Who did it? Slinn said that "some of the blame for the current confusion in world pulp markets could perhaps justifiably be laid at the door of the European Community's antitrust department whose recent requirement on the currency to be quoted by intensely competitive pulp producers may not necessarily be in the best interests of European consumers."

The producers who have benefited the most are those whose own currency has experienced the largest drop in value in relation to the dollar, thereby increasing their comparative cost advantage. In the past year, the list is headed by Brazil, whose currency has declined more than 65%; followed by Chile, almost 50%; South Africa, 41%; New Zealand, 34%; Finland, almost 20%; and Sweden, almost 18%. Even Canada's dollar has benefited to the extent of almost 9%.

Victim's condition. The wound inflicted on U.S. industry has not been fatal, but the victim is still in serious condition. "The prognosis for the remainder of this year is guarded, although the patient is expected to respond to some very effective medications. These include:

- Continued economic growth, both in the U.S. and overseas, will generate increased fiber demand, particularly if consumers rebuild their inventories.
- People's Rep. of China may make large purchases this year if they follow their two-year buying cycle. Last year China only purchased 300,000 tons of market pulp from Norscan producers after buying 600,000 tons in 1983.
- Comparatively lower factor costs for energy and labor have been helping U.S. producers survive.
- Plans announced for new U.S. paper capacity include some integration with existing market pulp production facilities. This will result in a decline in U.S. chemical paper-grade market pulp capacity beginning in 1986. ■

not been that rapid, according to Wergens. "The Swedish market share of EEC paper consumption is around 10% today, about the same level as a decade ago." And the growing exports of shorter fiber pulps to Europe from new supplying regions has diminished concern among EEC papermakers that they will be cut off from their pulp supplies.

JAPANESE MARKET—STILL NOT OPEN. U.S. Under Secretary of International Trade, Lionel H. Olmer, indicated in an address during API Paper Week that the U.S. government is "worried" about Japan's policies toward U.S. imports, especially for such industries as forest products.

"The market in Japan is simply not open to your products," he said. "We have a serious problem," he noted, indicating that the trade deficit in 1984 reached $124 billion and is conservatively expected to rise to about $150 billion this year.

Trade talks with Japan on four industries were begun last month, but the forest products negotiations were abruptly recessed when the Japanese refused to discuss tariff reductions, Olmer said.

The U.S. Under Secretary of Agriculture—who was heading the ~~talks~~ at the time—told Japanese negotiators that unless there was an attempt to discuss "common concerns," there would not be further discussions on forest products, and no further meetings have been set, he noted.

Olmer said that in its trade relations with Japan, the U.S. has become a developing nation, supplying raw materials and getting finished goods. Yet many industries—including forest products, which are at a competitive advantage to their Japanese counterparts—are not allowed to compete in Japan because of that country's restrictive trade policies.

In a statement released a few days earlier by the American Paper Institute, API's vice president, international, Irene W. Meister, noted that the U.S. forest products industry has a number of competitive advantages to the Japanese industry—including cheap raw materials and energy, skilled labor and progressive management, and the latest technology—and still the import share of consumption in the U.S. is so much greater than the import share in Japan.

"What forces are preventing import penetration there?" asked Dr. Meister. "Tariffs in Japan are obviously a first clear-cut barrier." In addition, other factors that should be taken into account include Japan's protective policies toward its own "sick" industries, which are not entirely bedridden, she noted.

"The paper industry welcomes the Market Oriented Sector Selective approach—the so-called MOSS. We understand that, as agreed between President Reagan and Prime Minister Nakasone, this approach is designed to identify and remove all nonmarket impediments to greater access to the Japanese market.

"If this process is successful," she continued, "it will go a long way toward an improvement in strained trade relations between our two countries."

RECORD WASTEPAPER USE. U.S. utilization and collection of wastepaper in 1984 set all-time records. In addition, exports shot up 25% from the previous year, pointed out J. Rodney Edwards, vice president of API's Paperboard Group.

"This is an outstanding achievement by the collection system in the U.S.," Edwards said, "demonstrating how effective supply and demand are balanced in a free market system."

Americans recovered 20.6 million tons, consumed 17.4 million tons, and exported 3.2 million tons of wastepaper in 1984, he noted. Collection of old newspapers is nearly 4 million tpy, or a 29% rate of recovery (collections to new supply of paperboard), compared with 27% for all paper stock (Table 3).

In 1984, collections of old news increased 400,000 tons from the previous year, reflecting strong demand from deinked newsprint mills, recycled paperboard mills, and export customers, Edwards said.

Collections of old corrugated containers rose 9.4 million tons—nearly 1 million tons ahead of last year—reflecting the increasing commitment of major chain stores to recycle their used cardboard boxes and the important role individual small collectors play in hauling this material to dealers' warehouses.

Demand for mixed paper also rose in 1984, with collections up by over 300,000 tons, despite the increasing amount of contaminants in this grade in the form of adhesives, coatings, and laminations.

The high level of activity at converting plants producing high-grade wastepaper clippings caused an increase in collections in this category. Increasing recycling of computer printout was also a factor.

Wastepaper was one sector of the paper industry which was not affected in the export market by the strong dollar, and further increases in exports are expected in 1985. "Exports in 1984 represented over 15% of all recyclable paper collected in the U.S.," said Edwards. "Overseas customers, planning to increase capacity based on wastepaper, look to the U.S. for additional supplies." ■

TABLE 3: **1983 and 1984 wastepaper data (short tons).**

	1984			1983		
	Consumption at U.S. paper and paperboard mills*	**Exports**	**Total collected**	**Consumption at U.S. paper and paperboard mills***	**Exports**	**Total collected**
News	3,315,657	539,431	3,855,088	2,992,000	461,214	3,453,214
Corrugated	8,136,372	1,260,845	9,397,217	7,443,001	993,436	8,436,437
Mixed	2,071,863	885,478	2,957,341	1,907,999	704,763	2,612,782
High grades	3,873,595	549,687	4,423,282	3,734,625	414,279	4,148,904
Other	50,249		50,249	44,375		44,375
Total	**17,477,736**	**3,235,441**	**20,683,177**	**16,122,000**	**2,573,712**	**18,695,712**

Source: American Paper Institute.
*Includes consumption at plants making molded pulp and insulation products.

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PULP & PAPER

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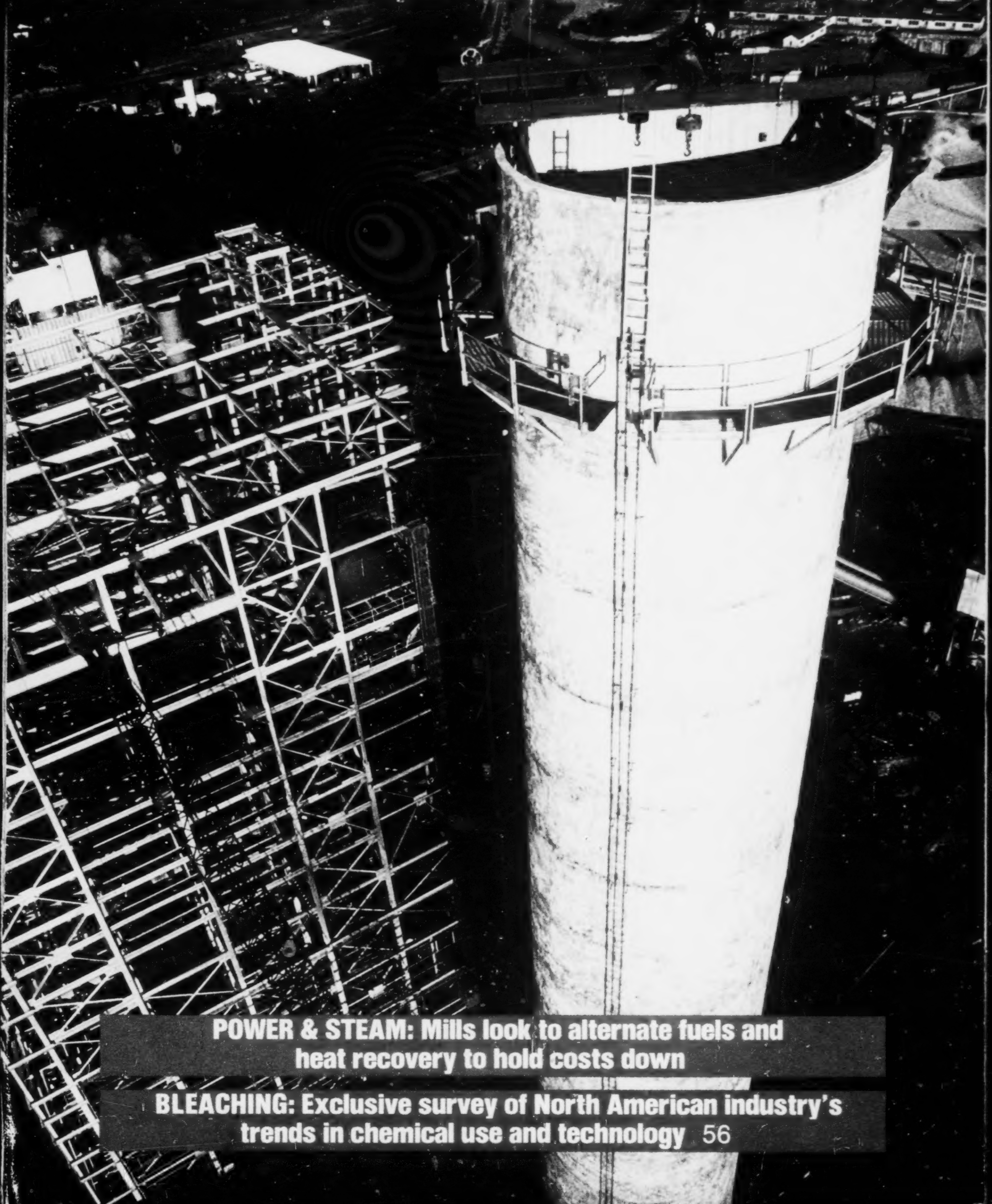

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A $300-million energy modernization project at Scott Paper's Mobile, Ala., mill is scheduled for completion in late 1985. The project includes a new 650,000-lb/hour multifuel power boiler. (Photo courtesy of Scott Paper.)

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Office locations

AT — Atlanta: 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339; (404) 432-3186; Telex 275015
SF — San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273
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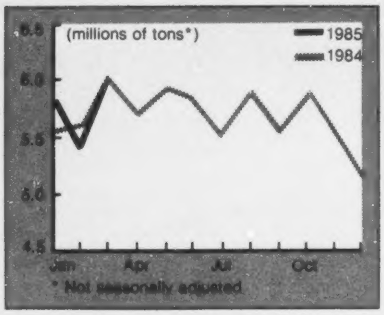
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 5.98 million tons in March, down 0.9% compared to last year, according to the American Paper Institute. Production for the first quarter was at a seasonally adjusted annual rate of 68.1 million tons, about the same as the 1984 fourth quarter but 0.3% below the year-ago period. The two-month moving average of seasonally adjusted data shows production trending downward, dropping from 69.5 million tpy in January to 67.3 million tpy in March. Preliminary data for April shows a further drop, API said.

Among major grades, paper production was fairly strong in the first quarter, with printing and writing papers flat compared to last year. Paperboard grades were down somewhat compared to last year, but most of the decline was in "other grades" and linerboard production for export, which fell 24% from 1984. Corrugated box shipments dropped 8.7% in March to 23.777 billion ft^2, the Fibre Box Assn. said.

Canadian newsprint shipments through the first quarter jumped 11.7% compared to last year, according to the Canadian Pulp & Paper Assn. The March operating rate was 94%, down from 95% last month. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Mar.	489	2.3	5,618	1.0
Uncoated groundwood (s)	Mar.	135	−5.6	1,518	−5.9
Coated paper (s)	Mar.	535	−0.4	6,377	2.8
Uncoated free sheet (s)	Mar.	820	4.9	9,461	0.5
Other printing/writing	Mar.	137	4.6	1,489	−13.9
Total packaging and other paper (s)	Mar.	455	−13.7	5,379	−8.4
Tissue	Mar.	430	0.9	4,953	1.7
Total paper	**Mar.**	**3,001**	**−0.7**	**34,794**	**−0.6**
Unbleached kraft paperboard	Mar.	1,504	0.5	16,774	−1.4
Semichemical medium	Mar.	430	−4.9	4,991	−3.4
Bleached paperboard	Mar.	350	−2.0	3,984	−2.2
Recycled paperboard	Mar.	693	−1.3	7,967	−3.1
Total paperboard	**Mar.**	**2,976**	**−1.0**	**33,716**	**−2.4**
Total U.S. paper and paperboard output	**Mar.**	**5,978**	**−0.9**	**68,510**	**−1.5**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Feb.	4,359	−3.9	53,724	−0.8
Market pulp production	Feb.	588	4.3	7,002	5.7
Wastepaper consumption at paper/board mills	Feb.	1,206	−5.5	15,366	−1.3
Pulpwood consumption (cords)	Feb.	6,981	−4.3	86,364	−0.6
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft^2)	Mar.	23.777	−8.7	67.241[6]	−0.7
Containerboard inventories at U.S. box plants and mills	Mar. 1	2,959	2.2		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Feb.	439	−46.1	1,057	5.2
Imports of Canadian newsprint	Feb.	281	−54.1	7,678	1.4
U.S. paper exports (including products)	Feb.	173	−46.6	3,766	−4.8
Exports of unbleached kraft linerboard	Mar.	138	−27.4	1,509	−24.0
Exports of woodpulp	Feb.	223	−29.7	3,144	−9.2
Norscan pulp inventories[4]	Mar. 31	1,762	−6.4		
Norscan pulp operating rates[4]	Mar.	89%	92%	90%	89%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Mar.	806	19.7	2,254[6]	11.7
Operating rates	Mar.	94%	95%	94%	94%
Inventories held by U.S. consumers	Mar. 31	1,535	24.4		
Other paper/board shipments	Mar.	266	19.8	764	13.2
Woodpulp shipments (export only)	Mar.	604	37.0	1,614[6]	8.5
Operating rates	Mar.	90%	60%	89%	72%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = shipments.

CORRUGATING MEDIUM: Flat output expected in 1985 as mills reduce inventory levels

Grade structure: Corrugating medium, the middle fluting material used in corrugated containers, is made from both semichemical pulp and recycled fiber. In 1984, about 78% of corrugating medium was made from semichemical furnish (which normally contains at least 20% recycled fiber), and 22% was "bogus" medium made from wastepaper. Basis weights of corrugating medium are 22, 26, 33, and 36 lb/1,000 ft². Standard sheet weight is 26 lb, which accounts for more than 80% of production. Recycled medium for equivalent uses is normally produced in slightly higher weights.

Production/capacity: Production of corrugating medium surged 8.5% in 1984 compared with the previous year, to nearly 6.6 million tons. Semichemical medium production increased 9.1% to 5.2 million tons, while recycled medium output rose 6.5% to 1.4 million tons. Semichemical medium mills operated at almost 99% of capacity in 1984 compared with 92% in 1983, while recycled medium mills ran at 94% last year.

Corrugated box shipments rose 5.9% in 1984 and, unfortunately, a significant portion of the increase in medium production went into inventory. Inventories of medium at box plants and mills at the beginning of 1985 of 773,000 tons (7.1 weeks of supply) were 153,000 tons higher than those of a year earlier. High production levels on existing machines, reactivation of several idle machines, increased imports from Canada, and a dropoff in exports have all contributed to the inventory buildup.

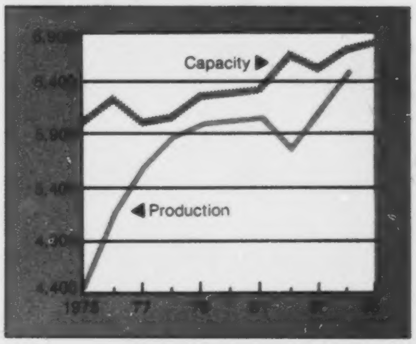
Outlook: Corrugated box shipments are forecast to rise only about 1.5% this year due to the impact of the strong dollar on industrial production. As a result, production of corrugating medium should be relatively flat at around 6.6 million tons, assuming about a 100,000-ton reduction in inventory levels. With only limited capacity growth this year, operating rates for semichemical medium will decline to around 97%, while recycled medium mills will continue to run at about 94%.

No new semichemical medium machines have been announced, and capacity is expected to grow at only about 1%/year over the entire 1985-87 period. This suggests a return to tighter market conditions once inventories have been reduced—barring a recession sometime next year. Recycled medium, however, may show somewhat faster capacity growth. Chesapeake Corp. will convert a linerboard machine at its West Point, Va., mill to 153,000 tpy of recycled medium in late 1986, and International Paper Co. eventually plans to produce recycled containerboard at a recently acquired mill in Riegelsville, Pa., which has been idle.

Pricing: Corrugating medium producers tried to push through a $30/ton price increase in the fall of 1984. The increase would have brought the price of 26-lb semichemical medium to $340/short ton in the eastern U.S., but it never really took effect. Discounting since then has driven the price to about $270 to $280/short ton in the independent box market, with some sales at even lower levels. Average price levels are probably close to break-even or unprofitable for most U.S. mills. Prices may begin to firm this fall if inventories are brought down to more normal levels and box shipments strengthen.

Price history at year-end for 26-lb semichemical medium in the eastern U.S. is as follows: 1975, $200; 1976, $200; 1977, $180; 1978, $210; 1979, $260; 1980, $260; 1981, $260; 1982, $240; 1983, $280; 1984, $310 (with discounting).

[illegible]



FORECAST ('000 tons)

	1983	1984	1985e
Production[1]			
Semichemical	4,731	5,162	5,150
Recycled[1]	1,306	1,391	1,400
Total	**6,037**	**6,553**	**6,550**
Capacity			
Semichemical	5,119	5,219	5,299
Recycled	1,427	1,482	1,493
Utilization rates (%)			
Semichemical	92.4	98.9	97.2
Recycled	91.5	93.9	93.8
Imports[2]	70	104	120
Exports[2]	74	50	50
Apparent U.S. consumption			
000 tons	6,033	6,607	6,620
lb/capita	51.5	56.3	56.2
GNP ratio	3.93	4.03	3.92

1. Production for domestic use only.
2. Semichemical medium only (Dept. of Commerce data).

TOP PRODUCERS [illegible]

	Annual capacity			Market share (%)
	Semi-chem	Recycled medium	Total	
1. Weyco	619	—	619	9.1
2. O-I	605	—	605	8.9
3. Stone	415	85	500	7.4
4. Inland	190	250	440	6.5
5. Champion	212	210	422	5.7
6. Willamette	230	120	350	5.2
7. Mead	330	—	330	4.9
8. IP	320	—	320	4.7
9. CCA	115	160	275	4.0
10. Va. Fibre	257	—	257	3.8
11. PCA	255	—	255	3.8
12. Smurfit	31[1]	210	241	3.5
13. G-P	225[2]	—	225	3.3
14. MacBlo	215[3]	—	215	3.2

Market share of top five companies: **38.1%**
Market share of top ten companies: **60.6%**
Total U.S. capacity (1985):
6.792[4] million short tons

1. Reflects 31% interest in 100,000-tpy mill of Groveton Paper Board.
2. Includes 50% interest in 130,000 tpy machine at Sonoco Products' Hartsville, S.C., mill.
3. Excludes 78,000 tpy of capacity at Sturgeon, Ont.
4. Semichemical and recycled combined.

SALES & EARNINGS

First quarter U.S. paper profits flat due to price discounting in many grades

U.S. paper industry profits rose 2.6% on a 5.7% increase in sales, according to a *Pulp & Paper* survey of 32 companies' results. The relatively flat profit performance after last year's series of strong quarterly gains reflected price discounting in many grades related to the strong U.S. dollar and also to overcapacity in some segments. Profits from wood products operations remained depressed, although in some instances they showed improvement over the first quarter of last year.

"Coated papers enjoyed strong demand and improved prices while newsprint also performed well. In contrast, uncoated white papers suffered from price discounting. Prices for market pulp and linerboard also continued to be weak," said John B. Fery, chairman and CEO of Boise Cascade Corp., summing up the mixed performance of various grade segments. Boise Cascade reported a 19.4% increase in profits on a 1% decline in sales compared with the first quarter of 1984.

Coated paper profits. Champion International Corp. recorded a 50% rise in earnings on a 43% jump in sales. The results show the first full quarter of 100% consolidation of St. Regis Corp.'s earnings with those of Champion. Champion led the industry in first-quarter sales at $1.65 billion. Results for publication papers continued to improve, and newsprint and uncoated grades were off. But price erosion on uncoated grades appeared to bottom out by the end of the quarter, according to Champion sources.

The firm market for lightweight coated paper contributed to the 73% rise in earnings for Bowater Inc., assisted by a healthy demand for newsprint. Nevertheless, Anthony P. Gammie, chairman and CEO, commented, "The strong U.S. dollar coupled with industry oversupply continued to depress margins for the company's market pulp sales. However, there are some indications that the bottom may now have been reached and that profit margins should begin to make a recovery in the subsequent quarters of this year."

Capacity operations in the coated printing papers area, combined with some price improvements plus increased tax credits were the major factors for Consolidated Papers Inc.'s brilliant 41% increase in earnings to a new record for the first quarter of this year.

Uncoated free sheet. Great Northern Nekoosa Corp. reported a 53% drop in first-quarter earnings due to a "deterioration in prices" for many of GNN's products. In 1984 net income had benefited from tax credits and capitalization of interest attributable to the Leaf River pulp mill construction. "Recently, we have observed gradual strengthening and signs of price firmness in some markets," he added.

Hammermill Paper Co.'s 48% drop in first-quarter net was attributed to a "negative pricing effect" caused by

The U.S. paper industry had an unspectacular first quarter.

	First quarter ($000)			
Companies	**Sales**	**Change 1985/84**	**Earnings[1]**	**Change 1985/84**
Boise Cascade	$957,520	−1.0%	$33,280	19.4%
Bowater	216,419	7.5	15,082[2]	73.1
Champion Intl[3]	1,645,814	43.4	43,756	50.2
Chesapeake	81,773	10.8	4,373	63.0
Consolidated	185,184	8.2	27,365	40.6
Crown Zellerbach	762,000	7.6	19,200	− 9.4
Federal Paper	153,341	10.4	2,291	−54.0
Fort Howard	308,688	0.8	33,194	12.0
Georgia-Pacific	1,580,000	6.2	49,000[2]	14.0
Glatfelter	72,505	−14.4	10,395	9.9
GN Nekoosa	498,200	8.5	13,900	−53.2
Hammermill	428,050	1.0	7,922	−47.7
International Paper	1,130,000	− 1.7	37,100	−32.9
James River (1/27)	582,636	4.7	14,864	−28.3
Kimberly-Clark	1,001,800	11.0	72,300[2]	35.9
Longview (1/31)	116,437	16.3	3,877	55.2
Louisiana-Pacific	270,990	−12.3	−1,300[2]	n.m.
Mead	670,400	2.0	23,600	9.3
Mosinee	47,047	− 9.8	1,847	−28.0
Pentair	145,314	21.7	6,096	5.4
Pope & Talbot	83,053	3.3	2,200	4.3
Potlatch	234,700	− 6.2	11,500	− 8.0
Scott	696,200	1.1	42,100	23.1
Sonoco	184,761	1.3	10,785	4.2
Southwest Forest	170,484	− 2.5	− 1,604	n.m.
Stone Container	307,115	− 2.7	8,087	225.0
Temple-Inland	313,500	0.0	21,700	4.3
Union Camp	463,687	− 5.5	29,765	−29.5
Wausau (2/28)	49,306	− 8.1	845	3.2
Westvaco (1/31)	429,503	3.7	22,731	15.6
Weyerhaeuser	1,275,700	− 0.1	38,248	4.4
Willamette	287,924	1.4	14,271	74.3
Total	**15,350,051**	**5.7**	**618,770**	**2.6**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.
2. **Bowater:** excludes 1984 quarter loss of $573 million from discontinued operations; **Georgia-Pacific:** excludes 1984 $8-million income from discontinued operations, includes 1985 $19-million pre-tax gain on timberland sales; **Kimberly-Clark:** excludes 1984 $7-million gain on stock exchange; **Longview Fibre;** excludes $2.2 million 1984 forgiven taxes; **Louisiana-Pacific:** excludes 1984 $18.7-million gain on sale of Natl. Gypsum shares, and 1985 $3.7-million gain from rebated FTC fine.
3. First quarter 1984 is first full quarter in which 100% of St. Regis earnings are consolidated with those of Champion.

increased domestic production and imports, worldwide supply and demand imbalances, and the strong U.S. dollar. Uncoated business papers account for more than half of Hammermill's earnings.

Another firm hit by adverse exchange rates is International Paper Co., which reported a 33% drop in earnings. "The strong U.S. dollar has affected our earnings by decreasing the price of exports and lowering export volume . . . we think prices have hit bottom and we expect upward movement in some product lines in the second quarter," said John A. Georges, International Paper's chairman and CEO.

Paperboard and packaging. Stone Container Corp. reported a surprising 225% increase in earnings on a 3% drop in sales, reflecting "reduced costs and expenses," according to the company's chairman Roger W. Stone. But Stone predicted a "difficult" second quarter this year, due in large part to planned mill shutdowns and price erosion.

Union Camp Corp., also a major uncoated free-sheet producer, posted a 29.5% decline in profits on a 5.5% decline in sales. "The strong dollar also made U.S. linerboard more expensive and therefore less competitive in foreign markets. This resulted in decreased exports, which caused an oversupply in domestic markets," chairman and CEO Peter J. McLaughlin noted.

Temple-Inland Inc. showed a 4.3% increase in profits on flat sales. Company sources noted that high containerboard inventories "caused the corrugated box market to become very competitive late in the quarter, resulting in an extremely irrational pricing environment."

Forest products. Weyerhaeuser Co. reported a 4.4% increase in first-quarter profits on a slight decline in sales. George H. Weyerhaeuser, president and CEO, noted, "Our northwestern lumber and plywood mills are producing results that range from significant losses to marginal profits." He said the company was "bombed" in 1984 and was "still feeling the impact on domestic prices of imported fiber products, low-cost foreign fiber capacity, and an overcapacity in solid wood products." ■

EXPANSION

Con-Bath to market bleached Bathurst CTMP

To cut losses at its Ellesmere Port, England, newsprint mill, known as the Bridgewater mill, Consolidated-Bathurst Inc. plans to restructure the mill's operations. Currently, chemithermomechanical pulp from the mill in Bathurst, N.B., (*shown above*) is shipped to the U.K. to supply over 60% of the fiber for newsprint production at the Bridgewater mill (*P&P*, Oct. 1984, p. 80).

As now planned, a C$40-million expansion of the 89,000-tpy deinked pulp plant at the Bridgewater mill will increase the plant's capacity between 35% and 55%, or 30,000 to 50,000 tpy. The proportion of deinked pulp in the mill's furnish, currently about 35%, will rise to about 50%. The proportion of CTMP supplied by Bathurst will be cut in half, to 80,000 tpy, and the remainder of the mill's fiber needs—some 30,000 tpy—will be purchased on the European market.

Market CTMP. On the other side of the Atlantic, a $16-million bleach plant using new technology developed by Ingersoll-Rand Canada and the Pulp & Paper Research Institute of Canada will be installed at the Bathurst CTMP mill. Con-Bath plans to bleach the 80,000 to 85,000 tpy of CTMP not required at the Bridgewater mill and sell it on the open North American market. Startup of the new bleach plant is scheduled for the fall of next year.

There are several advantages to producing market CTMP at Bathurst, according to Bart Duns, Con-Bath's vice president of pulp, kraft, and paperboard. One advantage is economies of scale. Bathurst has capacity for 360 tpd of semichemical pulp and 400 tpd of corrugating medium in addition to the 480-tpd CTMP mill. Having two CTMP lines is also important, Duns says, because it gives the mill the flexibility to vary pulp freeness from 90 to 500 to suit different applications. The new bleaching technology is cited as a third factor.

Producers of tissue and toweling comprise one set of potential customers for the new product, according to Duns. Because of the freeness of its product and the new bleaching technology, Con-Bath foresees a market among printing and writing producers as well.

Matane project. In a separate announcement, Con-Bath said that it was terminating its joint study with the Société Générale de Financement du Québec, a provincial agency, to investigate a possible bleached CTMP mill in Matane, Que. The plan was dropped after certain required conditions for the project could not be met, the company said. Plans had called for a 180,000-tpy facility to be owned jointly by Con-Bath and SGF. ■

CAPITAL SPENDING

U.S. paper companies to trim capital spending plans

Keeping in line with the recent cooling off in the economy, U.S. pulp and paper companies have scaled back their capital spending plans somewhat from earlier estimates, the Commerce Dept.'s Bureau of Economic Analysis reports. In a recent survey of U.S. business capital spending, conducted between January and March, paper companies reported plans to spend $7.83 billion on new plants and equipment in 1985.

That figure is down 7.1% from the spending plans of $8.43 billion reported in the last survey, conducted in October and November. The new figure still represents an increase of 9.6% over the record spending of $7.42 billion in 1984.

The latest BEA survey shows an 8.7% increase in planned spending for all U.S. business in 1985 and an 11.0% increase for the manufacturing sector. For nondurable manufacturing, the average planned increase for 1985 is 8.5%. The paper industry's planned 9.6% increase puts it fourth among nondurable goods manufacturers, behind the food and beverage industry—17.0%, chemicals—13.3%, and rubber—10.6%.

In addition to the new spending estimates, BEA has issued revised price deflators to adjust spending for inflation. The latest deflators prepared by the BEA indicate that capital goods prices increased 1.0% in 1984 and are projected to rise 1.3% in 1985. That compares with earlier estimates of 0.8% for 1984 and 1.5% for this year.

McGraw-Hill Economics' most recent survey of spending plans, conducted in January and February, estimates that paper company spending in the U.S. will total $7.46 billion in 1985, up 3.2% from estimated outlays of $7.23 billion in 1984.

McGraw-Hill also estimates that the paper industry will spend $8.39 billion on capital projects in 1986, an increase of 12.5% compared with this year. U.S. business as a whole will up capital expenditures 10.9% in 1985, and spending in the nondurables sector will rise 13.1%, according to McGraw-Hill.

Most major U.S. paper companies plan to increase capital outlays in 1985 or hold them steady at relatively high levels, according to a survey of recent annual reports. Georgia-Pacific Corp., for example, plans to boost spending for capital projects 100% in 1985 to about $700 million. G-P has major conversion projects underway in Crossett, Ark., and Monticello, Miss., and a new machine scheduled for 1986 startup at its Port Hudson, La., mill site.

International Paper Co.'s spending will rise 24% in 1985, even though its $500-million Georgetown, S.C., modernization was completed last year. The company plans to spend $590 million in 1985 on major conversions in Pine Bluff, Ark., and Mobile, Ala., among other projects.

Spending will decline at Crown Zellerbach Corp., Great Northern Nekoosa Corp., and Union Camp Corp., following the completion of recent major expansion projects by all three companies in 1984.

Champion International Corp. will hold capital improvements to about $400 million in 1985 and will postpone several major expansion projects until debt incurred in the acquisition of St. Regis Corp. last fall is reduced. Postponed projects include an uncoated free-sheet machine for the Quinnesec, Mich., market pulp mill (previously scheduled for 1987 startup), a lightweight coated paper machine at one of the former St. Regis mills, and a new off-machine coater for the Courtland, Ala., mill. Even with these cutbacks, however, Champion International's outlays this year will only decline by approximately 1% compared with its expenditures last year. ■

Capital spending plans of major North American paper companies (millions of $).

U.S. companies	1985	1984	% change 1985-84
Boise Cascade	$400	$456	−12.3%
Bowater	370	181	104.4
Champion International	400	405	−1.2
Consolidated Papers	147	59	149.2
Crown Zellerbach	190	252	−24.6
Federal Paper	50	44	13.6
Fort Howard Paper	200	157	27.4
Georgia-Pacific	700	350[1]	100.0
Great Northern Nekoosa	100	231	−56.7
International Paper*	590	476	23.9
Kimberly-Clark	450	382	17.8
Louisiana-Pacific	130	181	−28.2
Mead	92[2]	176	−47.7
Pentair	50-60	36	53.0
Potlatch	98	33	197.0
Scott Paper	450[3]	286	57.3
Sonoco	45	34	32.4
Southwest Forest Industries	38	43	−11.6
Stone Container	44	42	4.8
Temple-Inland	200	130	53.8
Union Camp	240	316	−24.1
Weyerhaeuser	450	383	17.5
Willamette Industries	31	31	0.6
Canadian companies			
Abitibi-Price	C$225	C$126	78.6
Consolidated-Bathurst	160	119	34.5

*Excludes capital outlays for timberland, other nonpaper/paperboard assets.

[1] Excludes $360 million for purchase of mill from St. Regis.

[2] Includes spending scheduled to continue into 1986.

[3] One half of the $900 million expected to be spent in 1985 and 1986.

Source: Recent company statements and annual reports.

BLEACHING

P&P exclusive survey: Trends in bleaching equipment, chemical use

The diverse application of technology continues; substitution of cheap bleaching chemicals and new mixing equipment applications popular

By MICHAEL J. DUCEY, Technical Editor

■ This article reports the results of *Pulp & Paper*'s third annual survey on bleaching. After tracking chemical consumption and newly applied technologies over the last three years, this year's report looks at the growth and trends of bleaching chemicals and equipment.

Participation in the survey has been tremendous. More than 150 people have responded to questionnaires and phone calls regarding the state of pulp bleaching and its effect on the industry as a whole. Seventy mills, representing 18 million fully bleached tpy, are involved, while 60 suppliers have helped in following applied technology trends. Canadian pulp bleacheries have also been included in the chemical usage survey, and their profile is presented in Table 1.

A separate report is mailed to each of the survey respondents, allowing them to evaluate the survey information in more detail. At the close of 1985, an online database of information will be available for personal computer users.

Pulp bleacheries are facing many economic and environmental pressures today. It is common knowledge that pulp prices are currently in a slump, chiefly due to the continued strength of the U.S. dollar. This puts all pulp operations on alert for production cost reductions to ease the effects of a declining market. It also leads to unscheduled downtime, which is not conducive to maintaining quality or efficiency. Finally, more competition is on the horizon as additional bleached pulp and white papers capacity comes online.

CHEMICAL DEMAND. Measures can and have been taken to avert the problems mentioned above. Substitution of cheap or excess chemicals is one of the oldest and most widely used cost-cutting measures. Table 2 identifies the number of mills in North America using this method.

The supply of bleaching chemicals should be stable during the next several years. Sodium chlorate, the chief reactant used in producing chlorine dioxide with onsite generation equipment, will be available from expanded sources in the U.S. South and Canada. On the other hand, chloralkali manufacturers have felt the effects of oversupply and are now beginning to achieve price stability. Chlorine prices have recently jumped $10/ton, and steady increases are likely if housing and other key industries continue to show growth.

Oversupply may be a problem for peroxide producers, as two companies have announced capacity expansions, and a new producing plant is planned in Canada for a 1987 startup. The major growth area for peroxide remains in groundwood bleaching, as chemical pulp bleachers have been slow to substitute or add peroxide to their bleaching sequences. The cheapest bleaching chemical continues to be oxygen, and its use has increased largely due to the development and application of dynamic mixing equipment. This trend is expected to continue strongly in both substitution and complete sequence additions, especially among mills converting to white papers.

Table 3 shows the work of mill engineers at Weyerhaeuser Canada's Kamloops, B.C., mill and how they used hypochlorite while other chemicals were in short supply.

DYNAMIC MIXING EQUIPMENT. Figures 2 and 3 show the growth of dynamic chemical/pulp mixers broken down by chemical and supplier. All operate at medium (10% to 15%) consistency, are available in two sizes, and are recommended for use with preretention tubes. A number of users of these units have documented very attractive paybacks (less than half a year in the best case, a full year in the worst case), primarily due to the reduction of chemicals consumed throughout the process. The chemical/pulp mixers do not have excessive power requirements, but they do require sufficient room for installation.

Growth in the use of these mixers stems from the fact that traditional tower mixers do not sufficiently mix pulp and chemicals into a homogeneous blend. Chemicals are added to the pulp through one or two nozzles located in mixing zones at the bottom of the tower. These zones are maintained with low-speed impellers and fixed baffles. However, stationary sections of the

TABLE 1: **Breakdown of Canadian bleach respondents, grouped geographically and by size.**

Total mills surveyed	**38**
Answered by mail	14
Answered by phone	12
Tonnage represented by survey (metric tpy)	5,160,000
Capacity (%)	47.6
Geographic distribution	**Number of lines**
East	10
Central	6
West	15
Size distribution	
Over 700 metric tpd	4
400 to 700 metric tpd	23
Under 400 metric tpd	4
6-tower plants	18
5-tower plants	9
4-tower plants	4

TABLE 2: **Use of chemical substitutes in the U.S. and Canada.**

U.S.	**Number of mills**
Cd	26
E_o	20
p	10
hypo	16
Canada	
Cd	20
E_o	16
p	6
hypo	6

pulp plug can occur, shortening the residence time of pulp passing through the tower. Sections of the top of the rising pulp plug sometimes show a strong greenish-yellow color as a result of high amounts of residual chlorine or chlorine dioxide.

The Swedish Forest Research Institute (STFI) and others have studied the effects of nonhomogeneous mixing and have concluded that as the deviation from ideal mixing increases, the amount of bleaching chemicals required to reach a given mean bleaching result rises considerably.

One report investigating the distribution of ClO_2 in a common tower arrangement concluded that dynamic mixers more than justify the cost of replacing tower mixers because of their superior mixing and chemical consumption advantages.[1] Mill officials of Stora Kopparberg undertook a study at their Skutskär mill using a method involving the injection of a LiCl solution with pulp and ClO_2 and drawing data from samples taken radially across the top of the D-stage towers. High overdosages in the center of the tower and along the periphery of the tower were found. The mill tried to improve the efficiency of the existing equipment but discovered that reducing pulp flow through the tower, increasing the power input in the mixing zone, and reducing pulp consistency all had minimal effects on mixing efficiency. The mill did not see substantial improvements until the installation of a Kamyr MC dynamic mixer, which is now saving $2 to $3/ton of pulp produced because of reduced chemical consumption. The mill has since fit all of its D-stage towers with the mixers and has virtually eliminated nonhomogeneity of the pulp mixture.

Kamyr has stated that its medium-consistency pump can act as a mixer in the same manner as its MC mixer. Kamyr has four installations currently using the MC pump in this dual function. Because the pump operates on the principle of fluidization, as do other dynamic mixers available on the market today, it seems possible that this type of equipment will replace dynamic mixers altogether.

ONSITE CHEMICAL GENERATION. As a new addition to the survey this year, manufacturers of onsite chemi-

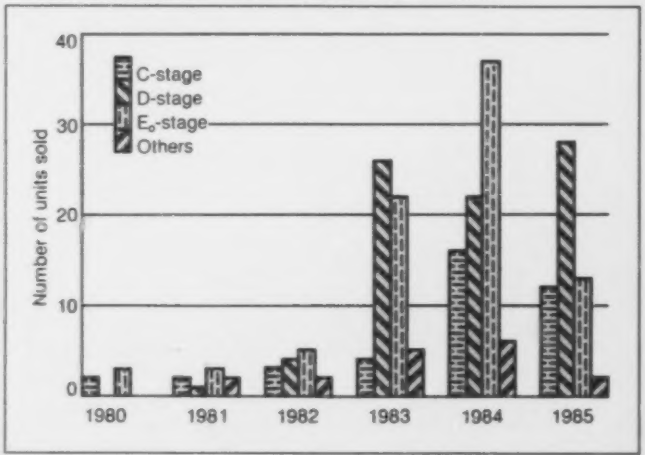
TABLE 3: **A summary of the modified sequences using hypochlorite and the respective ClO_2 saving.**

Sequence	**Hypo lb/ton**	**ClO_2 saving lb/ton**	**ClO_2 saving tpd**	**TAPPI brightness**
C_DEDED	0	0	0	90^+
$C_DE/HDED$	40	6	3.0	90^+
C_DEDE/HD	10	6	3.0	90^+
C_DEH/DED	15	8	4.0	90^+
C_DEH/D	15	5	2.5	88^+
C_DEHE/HD	30 + 5	22	11.5	89^+

TABLE 4: **Operating specifications for dynamic mixers.**

	Rauma-Repola	**Kamyr**	**Impco**	**Sunds Defibrator**
Sizes	3	2	2	2
Dimensions (ft^3)	47	45.5	57	50
	70	74.5	79	86.5
rpm	530	1,000	980	735
	680		650	
Motor (hp)	125	150	125	100
	200	200	200	270
Consistency	10 to 15	8 to 16	10 to 15	3 to 15
Total installations	**13**	**113**	**59**	**70**

FIGURE 1: **Worldwide installations of chemical mixers.**



cal generators were asked to comment on the future of their products in the pulp and paper industry. Many suppliers said this equipment is a "hard sell," particularly in the U.S. Close proximity to chemical sources, adequate delivery times, and stable (and sometimes depressed) chemical prices account for this situation. Of course, this is not the case in many other countries, and this type of equipment is being sold in fairly large numbers. Three startups in the U.S. are reported for the last 12 months.

Two suppliers, Chemetics and Lurgi, offer fully integrated bleach chemical manufacturing plants. Chemetics uses a chloralkali system using brine as the major reactant to form chlorine gas and caustic solution in an electrochemical cell. Hydrogen and sodium chlorate are coproduced by electrolysis of treated sodium chloride brine in a "diaphragmless electrolyzer." The hydrogen produced is sent with some chlorine to manufacture hydrochloric acid. HCl is formed in a synthesis unit where H_2 burns with the Cl_2 gas, forming HCl, which is then absorbed in soft water. HCl is transferred to the chlorine dioxide generator where it reduces sodium chlorate to produce ClO_2.

Lurgi offers a similar package, the chief difference being the chlorine dioxide generating process, which is the patented Munich process. The Munich process is a "closed" system consisting of cells arranged in two rows and connected electrically in series to a transformer/rectifier unit. Spent chlorate electrolyte reacts with brine to form sodium chlorate and hydrogen. A major portion of the chlorate electrolyte is recirculated into the cells via an electrolyte reaction tank. Hydrogen is sent to an HCl synthesizer, while NaClO3 moves on to the chlorine dioxide generator. Reaction of the HCl and NaClO3 takes place in a perpendicular multiple-compartment reactor, which is temperature controlled by low-pressure steam. The products are ClO_2 (absorbed in chilled water and stored), Cl_2 (transferred to the HCl synthesizer), spent brine, and water. This process can be connected with a membrane-type chloralkali electrolysis unit.

FIGURE 2: **Annual growth of chemical mixers per suppliers.**

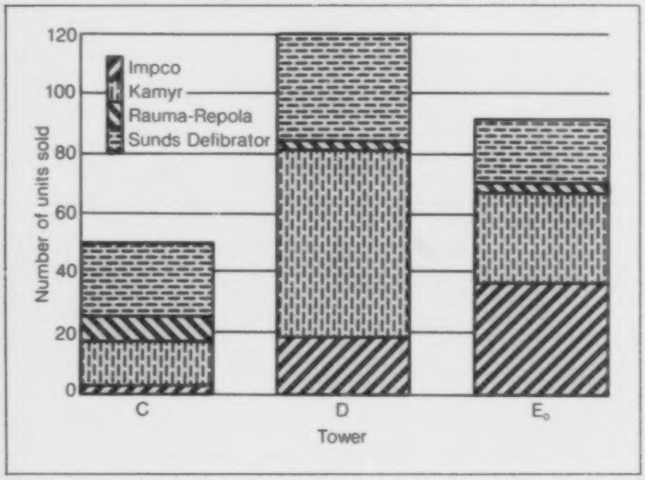
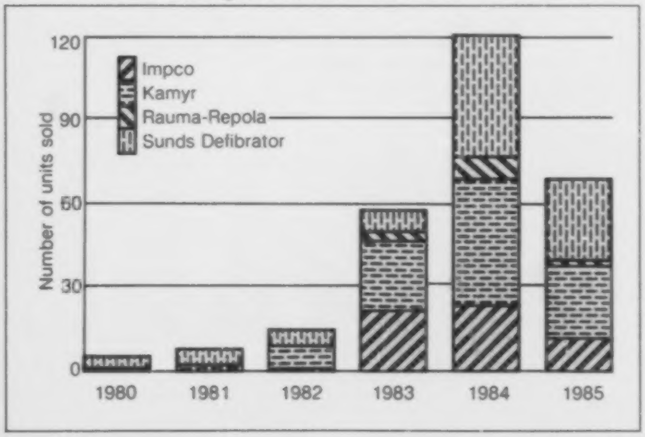


FIGURE 3: **Annual growth of chemical mixers.**



Neither company has sold many fully integrated systems, but each of them has had some success in starting up single-process units. Many other reputable equipment manufacturers sell either chlorine dioxide generators or chloralkali generators alone, and some manufacturers mentioned that if the market did take off for onsite chemical generation, they would be able to integrate their systems.

One of the reasons that ozone bleaching has not become a major factor in the industry (despite years of research confirming its ability to bleach pulp) is because its onsite generating capability is uneconomical. But hope may be on the horizon. A firm in Japan maintains that it has successfully started up a pilot-scale ozone generator that can produce the chemical at roughly one-third the cost of common U.S. generators.

THE CHANGING BLEACHING SEQUENCE. As in chemical addition, trends continue in displacement, split, and short sequence bleaching. Worth noting is International Paper Co.'s decision to switch technology and suppliers for its two recently installed bleach plants. IP's Georgetown, S.C., mill recently started up the largest displacement bleaching system in the world and its Mobile, Ala., plant plans to install the new three-stage "low-level" system later this year.

Also, the fact that two of the three latest greenfield mills in the U.S. will operate conventional plants (Champion International Corp., Quinnesec, Mich., and Leaf River Forest Products Inc., New Augusta, Miss.) with the other mill (Union Camp Corp., Eastover, S.C.) using oxygen delignification, makes it tough to predict what technology will be applied next.

Two bleach plants, Georgia-Pacific Corp.'s Crossett, Ark., facility and Consolidated Papers Inc.'s Wisconsin Rapids, Wis., plant, split their sequences last year, chiefly through the introduction of oxygen with dynamic mixers at the E1 stages. James River Corp.'s Naheola, Ala., mill has announced plans to convert two bleaching lines into three with help from dynamic mixers and more efficient chemical consumption targets. Two other mills have studied this concept, but they have not taken action.

The invention of the Kamyr continuous diffuser still dominates that company's new bleach plant product line, along with displacement bleaching (a second system will be added in Japan in 1985) and the diffusion washer. An upgraded oxygen system is being promoted to challenge the short sequence systems offered by Impco and Sunds Defibrator.

Sunds has been offering a three-stage, rapid mixing system for the last four years using Sweden's Norrsun-

(Continued on p. 66)

FIGURE 3: **Simplified model.**

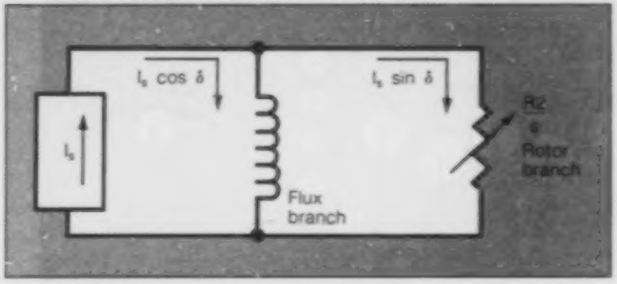


FIGURE 4: **Vector diagram for the control system.**

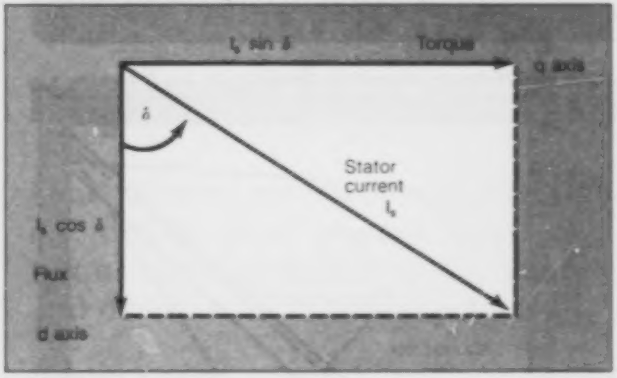
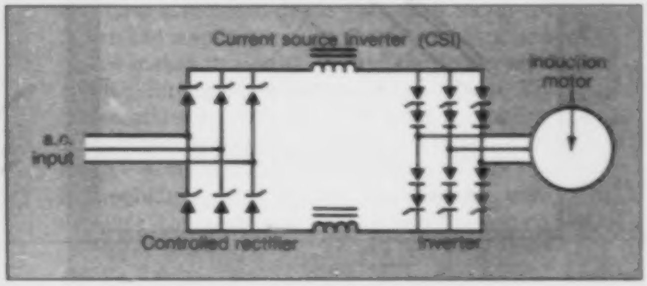


FIGURE 5: **Power circuit for the drive system.**



tor. As more torque is required, this speed difference, or slip, of the motor increases. In frequency-programmed drives, the stator electrical speed is fixed, and thus the rotor speed must change with load. In vector control, the output frequency is correctly adjusted to maintain constant rotor speed regardless of load.

Information on the flux position is required to implement the control strategy. Since imbedded flux sensors in the motor windings are impractical, most techniques use a shaft encoder to provide rotor position information. Since the instantaneous rotor position is known, the instantaneous phase angle and magnitude of the stator current can be produced, and the torque angle can be directly controlled. Dynamic torque response of 10 milliseconds and speed regulation of 0.3% of base speed is reasonable. Transient response is excellent since the torque angle is under constant control.

The current source inverter is commonly used for this type of control since its directly controlled outputs are frequency and current. The power circuit is inherently regenerative without additional power components (Figure 5). It operates through all four quadrants without bridge crossover problems or problems due to discontinuous current since the minimum magnetizing current of the induction motor is always present. ■

CHEMICAL BLEACHING SURVEY

(Continued from p. 66)

det market pulp plant as its show piece. Impco is now challenging this product with a system that promises flexibility, reliability, low capital cost and low operating costs. The plant is said to have minimum space requirements, low head requirements and thus lower power consumption and higher operating consistencies to save on chemicals and steam.

With all the laboratory success in electrochemical bleaching it seems feasible that this process will be challenging chemical bleaching systems in the next decade. A report from Egypt described an apparatus using seawater to bleach sulfite and kraft pulps.[2] Pulps achieved 75% GE and 70% GE, respectively. The rate of kraft bleaching appears from the data to be faster than sulfite bleaching. Viscosity of the pulps was comparable to other single-stage prepared pulps, while effluent color was lower, as would be expected. Small additions of chromium salts enhance the process by reducing power input and suppressing corrosion and hypochlorite reduction at the cathode. In addition, current efficiency is improved.

A commercial product called "The Pulper," a batch unit built as large as 100 tpd, will bleach pulp to 90% GE. This unit uses saltwater and a patented anode/cathode configuration that liberates free radicals and other bleaching agents.

HIGH-TECH BLEACHING. Touch screens, "smart" transmitters, and linkable hardware are currently the most popular process automation topics, with artificial intelligence being the most talked about software. Very little new has been announced in sensor technology, but the existing products seem to be doing quite well in the marketplace.

The survey revealed that capital expenditures for automation equipment are not on the level of chemical mixers, but they are growing at a steady pace. Large systems often encompass other mill operations, especially with the availability of totally integrated control schemes. The range from sensor control to process-wide control in terms of dollars is $20,000 for a single-stage to $2 million for a five-stage sequence. Discounting may also become a factor in this market.

METALLURGY BREAKTHROUGH. Another development gaining interest is the introduction of Hastelloy Alloy-22, a new metal from Cabot Corp. Alloy-22 is formulated as 22% chromium, 13% molybdenum, and 3% tungsten to increase acid corrosion resistance and thermal stability properties and to accept a compromise of the localized corrosion properties and the uniform corrosion resistance in nonoxidizing acids. Applications in bleach plant scrubbers and washer drums were among the first to be documented. ■

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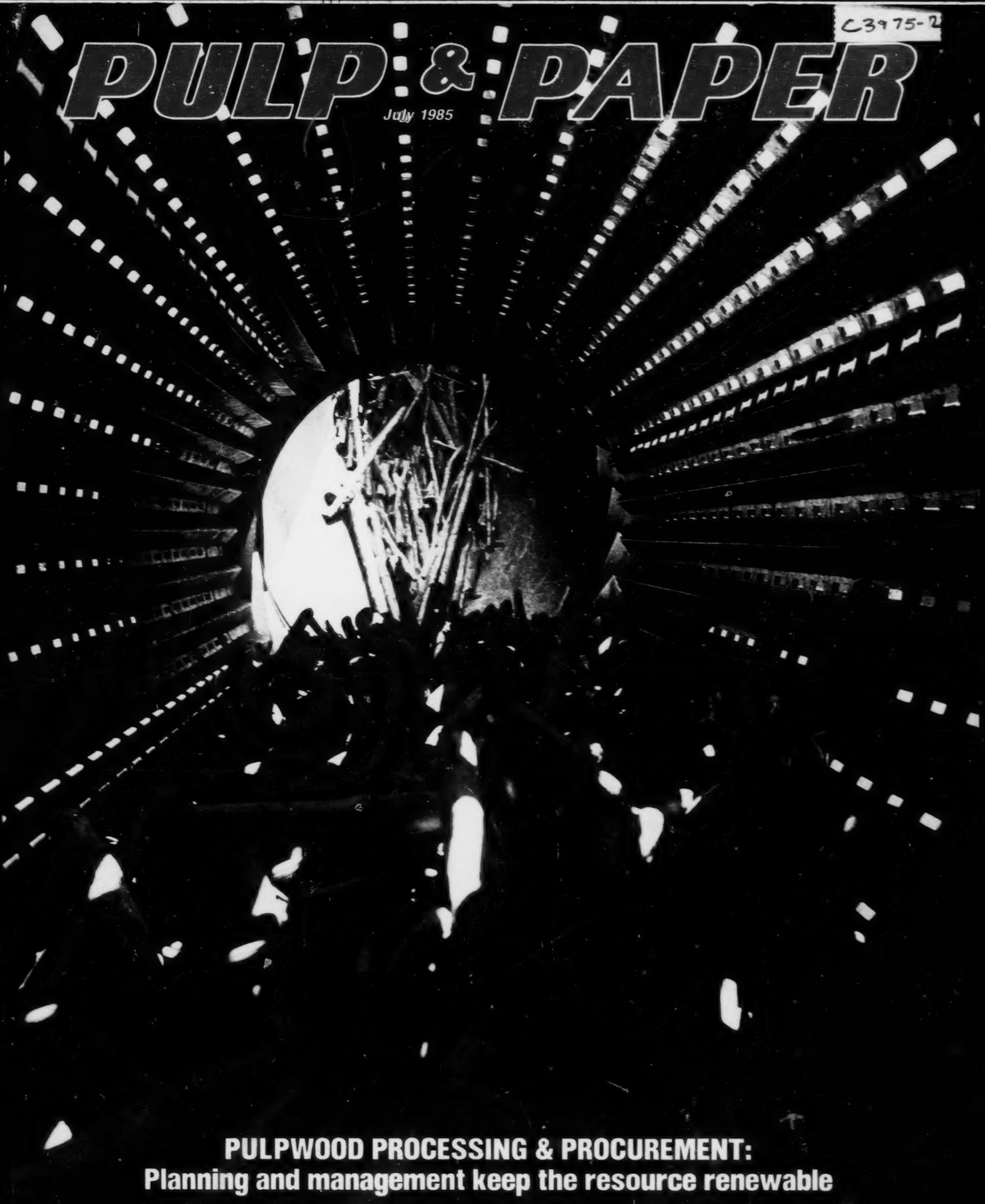

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EDITORIAL STAFF
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[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] Parkway N.W. Suite
[illegible] Telex 27005
[illegible] Howard St., San Francisco, Calif.
[illegible]
[illegible] Lexington Ave., New York, N.Y.
[illegible]
[illegible] Belgium; Telex

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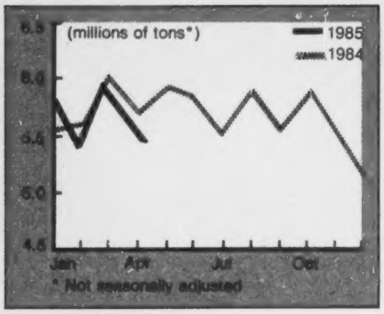
U.S. paper and board production



U.S. production of paper and paperboard in April continued to lag year-earlier levels, according to the American Paper Institute, weighing in at 5.46 million tons, down 5.2% from April 1984. API's moving average for March and April showed production continuing to trend downward, as it has since January, although preliminary data for May indicate that the slump may have bottomed out. The trend position stood at at 65.1 million tons in April, down 5.4% from January.

Among major grades, coated paper and uncoated free-sheet shipments were up, while tissue also registered gains. Packaging grades fell off sharply, however, and newsprint was also down. Kraft linerboard suffered a sharp 10.0% drop in April as a number of mills took downtime to reduce excess inventory, while production for export dropped 16.0% in April and 28.2% on an annualized basis. Corrugated box shipments rose 2.1% in April, according to the Fibre Box Assn.

Canadian newsprint shipments rose 7.4% in April, the Canadian Pulp & Paper Assn. said, while U.S. imports of Canadian newsprint jumped 30.4%. Operating rates climbed to 91% in April, up from 89% in March. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Apr.	427	−8.2	5,493	−1.3
Uncoated groundwood (s)	Apr.	124	−2.4	1,491	−7.2
Coated paper (s)	Apr.	502	−1.0	6,312	1.7
Uncoated free sheet (s)	Apr.	813	9.3	9,564	2.2
Other printing/writing	Apr.	99	−23.8	1,224	−18.0
Total packaging and other paper (s)	Apr.	406	−18.3	5,253	−10.2
Tissue	Apr.	399	−1.5	4,911	1.2
Total paper	**Apr.**	**2,788**	**−3.0**	**34,468**	**−1.3**
Unbleached kraft paperboard	Apr.	1,284	−10.0	16,423	−3.8
Semichemical medium	Apr.	411	−3.7	4,973	−3.7
Bleached paperboard	Apr.	342	−1.7	4,008	−2.3
Recycled paperboard	Apr.	637	−7.3	7,677	−4.1
Total paperboard	**Apr.**	**2,674**	**−7.4**	**33,102**	**−3.7**
Total U.S. paper and paperboard output	**Apr.**	**5,462**	**−5.2**	**67,570**	**−2.5**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Mar.	4,819	−0.8	55,160	−0.6
Market pulp production	Mar.	610	3.0	7,108	5.0
Wastepaper consumption at paper/board mills	Mar.	1,362	−1.9	15,583	−2.8
Pulpwood consumption (cords)	Mar.	7,651	−47.2	88,180	−52.2
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Apr.	22.582	2.1	89.823[6]	0.2
Containerboard inventories at U.S. box plants and mills	Apr. 1	3,023	2.2		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Mar.	1,046	28.0	11,233	12.7
Imports of Canadian newsprint	Mar.	759	30.4	8,154	10.6
U.S. paper exports (including products)	Mar.	355	−9.7	3,932	−6.6
Exports of unbleached kraft linerboard	Apr.	142	−16.0	1,531	−28.2
Exports of woodpulp	Mar.	399	6.7	3,688	−3.0
Norscan pulp inventories[4]	Apr. 30	1,589	−9.8		
Norscan pulp operating rates[4]	Apr.	76%	90%	92%	87%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Apr.	753	7.4	3,011[6]	10.7
Operating rates	Apr.	91%	89%	95%	85%
Inventories held by U.S. consumers	Apr. 30	1,519	27.8		
Other paper/board shipments	Apr.	255	17.5	993	11.1
Woodpulp shipments (export only)	Apr.	551	27.3	2,154[6]	12.2
Operating rates	Apr.	77%	80%	86%	74%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = shipments.

RECYCLED PAPERBOARD: Prices erode as market reacts to poor demand; capacity holds steady

Grade structure: Made almost entirely from secondary fiber, recycled paperboard includes boxboard, corrugating medium, linerboard, core, can and tube stock, and gypsum linerboard but excludes other construction papers and boards. It is divided into three categories: folding boxboard, setup boxboard, and paperboard. Folding boxboard is clay coated, while setup boxboard is uncoated. Recycled paperboard can be produced on both fourdrinier and multi-ply paper machines.

Production/capacity: Production rose 6.2% to 7.9 million short tons in 1984 from 7.4 million tons in 1983. Demand, however, began to slide in the early part of 1985 and for the first quarter was down 3.1% compared with a year ago, according to American Paper Institute figures. Production of boxboard held fairly steady for the first quarter, but output of gypsum liner was off 15%, while recycled tube, can, and drum stock was down 4.6%.

Once again, capacity increases will be insignificant in 1985, rising just 0.6% to 8.8 million tons from 8.7 million tons in 1984, according to API. This should keep operating rates around 92%, a bit above 1984's 90.3%.

Ownership changes could alter this forecast. Federal Paper Board Co., for instance, acquired and soon afterward shut down Nabisco Brands Inc.'s Marseilles, Ill., recycled boxboard mill. Champion International Corp. recently sold two recycled paperboard mills and six folding carton plants to Trident Associates, an investment firm, which apparently will run the plants. International Paper Co. purchased and plans eventually to reactivate an idle recycled containerboard in Riegelsville, Pa. In addition, Inland Container Corp.'s 175,000-tpy recycled linerboard mill in Ontario, Calif., is expected to be completed late in 1985.

Outlook: While the forecast for boxboard at the beginning of the year appeared promising, demand began to slip in the first quarter and slid faster in the second quarter, causing prices to deteriorate.

While housing and auto markets remained relatively firm through the first quarter and housing starts began to pick up in March, keeping the lower grades active, demand for folding carton was sluggish. Some observers attributed the fall off in orders to the surge in imports of finished goods already packaged.

Recycled paperboard production is expected to reach 8.1 million tons in 1985, 3.1% ahead of last year. Prices, though, will be weak in the folding carton market due to continued competition from alternate materials, especially solid bleached sulfate (SBS) and solid unbleached sulfate (SUS).

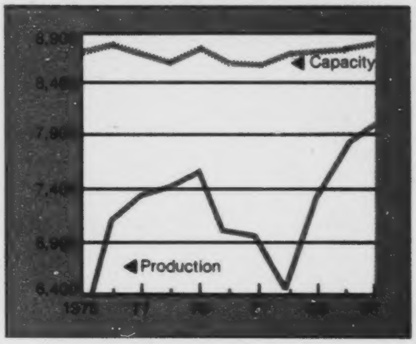
Adding to the price pressure has been a sharp drop in wastepaper costs (as much as 50% for some grades) since the beginning of 1984.

Prices: Prices for the lower grades such as chipboard and white-lined vat should remain flat throughout the second half of 1985. Clay-coated recycled board prices, however, were volatile through the first half, with spot market levels considerably lower than the December 1984 list. Market executives expect some improvement in transaction levels later in the year, but no list price increases.

Clay-coated 20-pt folding boxboard (rolls), $/short ton, year-end: 1975, $257; 1976, $262; 1977, $284; 1978, $305; 1979, $355; 1980, $380; 1981, $400/425; 1982, $380/425; 1983, $370/425; 1984, $375/425. Bending 20-pt chipboard (rolls), $/short ton, year-end: 1975, $204; 1976, $212; 1977, $219; 1978, $225; 1979, $260; 1980, $260/275; 1981, $270/280; 1982, $280; 1983, $280/300; 1984, $300.

Markets: Market demand for recycled paperboard grades, measured by their capacity share is: folding boxboard, 30.0%; setup boxboard, 3.6%; corrugating medium, 17.0%; gypsum linerboard, 14.2%; linerboard, 4.8%; container chipboard and filler board, 2.9%; other paperboard, 27.3%. ■

SUPPLY/DEMAND ('000 tons)



FORECAST ('000 tons)

	1983	1984	1985e
Production[1]	7,398	7,858	8,100
Capacity[1]	8,692	8,702	8,756
Utilization rate	85.1%	90.3%	92.5%
Imports	50	69	80
Exports	150	169	180
Apparent U.S consumption	7,298	7,758	8,000
lb/capita	63.2	66.5	67.9
GNP ratio	4.82	4.79	4.80

e = Estimate.

[1] American Paper Institute data.

TOP U.S. PRODUCERS ('000 tons)

	Annual capacity	Market share (%)
1. CCA[1]	640	7.3
2. Sonoco Products[2]	568	6.5
3. Jefferson Smurfit	534	6.1
4. Newark Group[3]	500	5.7
5. Champion Intl.[4]	480	5.5
6. Caraustar[5]	450	5.1
7. National Gypsum[6]	400	4.6
8. Rock-Tenn[7]	307	3.5
9. Federal Paper	300	3.4
10. PCA	189	2.2

Market share of top five companies: **31.1%**

Market share of top ten companies: **49.9%**

Total U.S. capacity (1985):
8.756 million short tons

[1] Sold the Chicago, Ill., Cincinnati, Ohio, and Chattanooga, Tenn., uncoated recycled board mills to Caraustar Industries Inc., September 1984.

[2] Closed Richmond, Calif., core and tube stock and chipboard mill, Mar. 1, 1984.

[3] Sold Uncasville, Conn., mill to Stone Container Corp. and bought Stone's Franklin, Ohio, and Mobile, Ala., mills, August 1984.

[4] Acquired St. Regis Corp.'s recycled board mills in merger.

[5] See footnote 1.

[6] Inoperative Kalamazoo, Mich., gypsum linerboard mill is included.

[7] Bought Stroudsburg Paperboard Co.'s Stroudsburg, Pa., mill, October 1984.

Despite recent sluggishness in the economy, U.S. pulp and paper companies now plan to spend $7.59 billion on new plants and equipment in 1985, up 6.2% compared with 1984. The new figure represents an increase of about 1.7% over earlier 1985 plans. About 52% of the total is destined for capacity expansion and 48% for replacement and modernization, according to McGraw-Hill. That compares with a 53%/47% split in 1984.

Preliminary plans for capital expenditures in 1986 were also revised upward in the latest survey. Papermakers now plan to spend about $9.1 billion in 1986 on capital projects, up 8.3% compared with earlier planned outlays. Some 55% of that total is slated for expansion projects. Outlays for 1987 and 1988 are estimated at $8.34 billion and $7.85 billion, respectively, McGraw-Hill said.

Planned spending increases are less robust in pulp and paper than in other nondurable manufacturing industries which, except for textiles, plan double-digit hikes in 1985 capital outlays. Papermakers are building on a stronger 1984 spending base than other nondurables manufacturers, however, since they were quicker to boost spending last year than the others.

Overall, U.S. business is less bullish on spending plans than earlier this year, when a 10.9% increase was planned. U.S. companies now plan to spend $388.4 billion on new plants and equipment in 1985, up 9.9% compared with last year. ■

IP offers early retirement

International Paper Co. has offered early retirement to 1,000 of its employees in the U.S. The company also plans to lay off an undetermined number of salaried employees, a company spokeswoman said. IP had a work force of 32,300 at the end of 1984.

"The strong dollar and Canadian imports have turned building materials into a disaster area," the spokeswoman said. "The demand is there, but because of subsidized Canadian lumber, our building products can't compete." ■

SALES & EARNINGS

Canadian first-quarter earnings increase 535%

Total earnings of C$88.3 million in the first quarter of 1985 for 13 Canadian companies compare healthily with the $13.9 million recorded for the 1984 period. Total sales for the period were up 18.2% at $3.4 billion, compared with $2.9 billion for the first quarter of 1984.

Abitibi-Price Inc. posted a 129.3% increase in earnings, to $23.7 million from $10.3 million, which it attributed to an increase in sales, higher operating levels, and the favorable U.S.-Canadian exchange rate.

Although down from fourth quarter of last year, Consolidated-Bathurst Inc.'s first-quarter 1985 earnings improved 59.5% over the 1984 first quarter, based on sales of $411.6 million, with the pulp and paper group showing improved earnings.

Improved operation of the Atholville, N.B., pulp mill and continuing good demand for both coated and uncoated groundwood papers, plus improved demand for wood-free printing papers, were cited by Fraser Inc. as contributing to better earnings over the last two quarters of 1984. However, earnings for first quarter of this year were down 54.8% from the first quarter of 1984.

After reporting a 16.3% increase in earnings for the quarter, Domtar Inc. announced plans to propose a 2-for-1 stock split of common shares at its June 3 annual meeting. President and CEO James Smith said expectations for newsprint, pulp, and packaging are uncertain, but that business papers and construction materials, among others, should perform well.

The East/West split (with the West on the losing side) faded as only one company, Canfor Corp., reported an earnings loss. In the first quarter of 1984, British Columbia Forest Products Ltd., Canfor, Crown Forest Industries Ltd., and MacMillan Bloedel Ltd. all reported losses.

However, MB stated that first-quarter 1985 results "are still far from satisfactory and reflect oversupply conditions for most of the company's major product lines," and that the net did not cover preferred dividend requirements. MB said that it would not pay its regular quarterly 2% common stock dividend but would pay annual dividends at a time and in an amount yet to be decided. This will "preserve retained earnings."

The Canadian paper industry experienced a healthy first quarter.

	First quarter (C$000)			
Companies	**Sales**	**Change 1985/84**	**Earnings[1]**	**Change 1985/84**
Abitibi-Price	C$581,433	23.5%	C$23,723	129.3%
British Columbia Forest Products	277,600	62.1	8,000	n.m.[2]
Canfor	248,500	9.8	(16,600)	n.m.
Cascades	53,923	51.3	2,409	8.6
Consolidated-Bathurst	411,600	4.3	19,300	59.5
Crown Forest Industries	192,900	42.2	3,000	n.m.[2]
Domtar	527,300	3.6	28,800[3]	26.3
Donohue	110,800	6.2	6,300[4]	1.6
Fraser	142,321	9.0	1,830	−54.8
Great Lakes Forest Products	148,162	8.1	4,838	2,248.5
MacMillan Bloedel	538,600	30.8	2,600	n.m.[2]
Rolland	75,700	11.2	1,355	−35.5
Scott Paper	68,702	12.0	2,762	6.8
Total	**3,377,541**	**18.2**	**88,317**	**535.1**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.
2. Not meaningful due to loss in 1984 quarter.
3. In latest quarter, a special gain of $5.2 million from U.S. tax credits made final net $35 million. In year-ago quarter, a special gain of $5 million made final net $27.8 million.
4. 1984 earnings restated by company to include investment tax credit.

(   ) = Loss. n.m. = Not meaningful.

MARKET PULP

Few greenfield market pulp mills seen for the '80s

While market pulp demand may remain strong through 1986, the many new expansion projects starting up in various parts of the world will probably keep the market in oversupply over the next two to five years, Jaakko Pöyry, chairman of Jaakko Pöyry Group, told a recent Finncell market pulp symposium held in Nice, France.

These new projects have significantly expanded world market pulp capacity over the past two years and will continue to increase supply for a few more years. The total additional capacity from these projects is more than 2 million tons, or close to 10% of world market pulp consumption, he noted.

"Against this background, my conclusion is that pulp prices will remain depressed for several years, possibly for the rest of this decade," he said. "If this holds true, the profitability of the pulp industry will remain low in most regions, constituting a major obstacle to new pulp mill expansions." Few greenfield market pulp mills are likely to be built anywhere in the world.

Soaring capital costs. In addition to poor profitability, another deterrent to pulp mill expansion is the sharp rise in investment cost for new mills. In the 1960s, a new kraft pulp mill in Sweden with a capacity of 100,000 tpy would have cost $25 million. In 1984, the size would have been 300,000 to 350,000 tpy, and it would have cost about $300 million—even more if infrastructure is included. This rise in cost has been due to the growing size of the new mills in an effort to take advantage of economies of scale.

Pöyry said total production costs for a new bleached kraft softwood pulp mill in Sweden are about $530/metric ton and range from about $600 to $630 in other regions of the world. This means that the present price of $360 to $390/metric ton for NBSK is too low to justify investment in a new pulp mill.

The situation is the same for a new bleached hardwood pulp mill. A new mill in Sweden or Portugal would have the lowest costs—about $420 to $430/metric ton, while costs elsewhere would be higher, ranging from $570 to $580/metric ton. Again, the current price of $330 to $350 for hardwood kraft pulp is too low to justify investment in a new mill, according to Pöyry.

He made further estimations for different regions of the world. The softwood pulp production costs of North American producers are more than $100/metric ton higher than Swedish mills for pulp delivered in western Europe. "The present sales price is barely sufficient for the best Swedish mills but clearly unsatisfactory for the North American mills," he noted. ■

New market pulp mills starting up over the 1984-86 period.

Company	Location	Startup	Capacity/grade (000 metric tpy)
North America			
Leaf River Forest Products	New Augusta, Miss.	9/84	335 BSK, BHK
International Paper	Georgetown, S.C.	9/84	280 BSK, BHK
Champion International	Quinnesec, Mich.	1986	260 BHK
Latin America			
Celgusa	El Rancho, Guatemala	2/85	100 BSK
Aracruz	Aracruz, Brazil	2/84	60 BHK
Manasa	Brazil	1985	60 BHK
Africa			
Mondi	Richards Bay, South Africa	11/84	150 BHK
Sappi	Ngodwana, South Africa	1985	50 BSK, BHK
Western Europe			
Soporcel	Leirosa, Portugal	6/84	300 BHK
Pols	Pols, Austria	12/84	190 BSK
Metsä-Botnia	Aanekoski, Finland	5/85	100 BSK, BHK
Eastern Europe			
Czechoslovakia	Paskov, Czechoslovakia	6/84	200 BSS
Asia			
Taiwan Pulp & Paper	Hsinying, Taiwan	2/85	130 BHK
Indah Kiat	Sumatra, Indonesia	10/84	100 BHK
Total			**2,316**

BSK = Bleached softwood kraft. BHK = Bleached hardwood kraft.
BSS = Bleached softwood sulfite.
Source: Jaakko Pöyry.

U.S. market pulp suppliers to remove 2 million tons by '92

"U.S. market pulp producers will withdraw at least 2 million tons of capacity from the market by 1992," H.C. Bowen Smith, managing director of stock research for Salomon Brothers Inc., told a recent Finncell market pulp symposium in Nice, France. "If they do not, they will be making a serious mistake" for the following reasons:

- The majority of U.S. market pulp producers are already partly integrated and have developed distribution systems for printing/writing papers.
- The strong dollar has made U.S. producers less competitive and has resulted in poor profits. These conditions are likely to exist for a long time.
- U.S. wastepaper exports, which have grown dramatically in recent years, are indirectly competing with U.S. pulp exports.

Running to pay off debt. Smith said that on a variable-cost basis, most U.S. market pulp producers are still making money. He estimated the average variable production cost of a U.S. southern softwood producer at $385/metric ton, and a hardwood producer at $325/metric ton (including $45/ton delivery cost to Europe).

PULPWOOD
PROCESSING

Industry commitment to reforesting private lands is crucial to the future

Current reforestation efforts impact only 1% of private landowners; more effort is needed to increase yields and ensure profitable future forests

By R. SCOTT WALLINGER

■ Many paper mills depend on nonindustrial private forests for more than half of their wood supply. These forests are owned by small landowners—a group of some 8 million individuals who own almost 60% of U.S. forestland. Industrial concern about small landowners as pulpwood suppliers has centered on three uncertainties: availability, cost, and management of the land for desirable species and growth rates.

Availability and cost are not seen as significant short-term issues. Land management intensity, tree growth, and reforestation are the real concerns mills have regarding small landowners. Several opportunities exist to increase this source of wood. The land and forest are important, but the real focal point for improved private forest management is the landowners themselves.

TYPES OF LANDOWNERS. Many owners are motivated to practice good forestry by a strong sense of stewardship. They want to leave their forestland as good as they found it, or better, and this desire is enhanced by anticipation of future profits. These owners generally seek and accept professional forestry advice. These are the kinds of owners that are recognized under the Tree Farm Program, administered by the American Forest Institute, and directly managed by state forestry groups. Much of what industry and government agencies are doing to educate forest owners and to recognize good forest management enhances feelings of stewardship.

Mr. Wallinger is vice president and manager, Timberlands Div., Westvaco Corp., New York, N.Y.

Other owners have other objectives. To some, ownership of forestland is a sideline to their main interest: a farm, a residence, or a recreation area. Some owners are speculators, looking for returns from the sale of the property. They are unlikely to increase their holding costs to make investments in forest management. Another category of forest owner could be described as custodial, with no investment strategy to speak of.

It is also not unreasonable to expect that many landowners are skeptical about the profitability of investments in forest management. Any return on investment must come solely from stumpage, without value added from manufacturing or other areas that rationalize industrial forest investments. A popular cartoon from *New Yorker* magazine shows a man in the forest telling his son, "It's good to know about trees. Just remember, nobody ever made any big money knowing about trees."

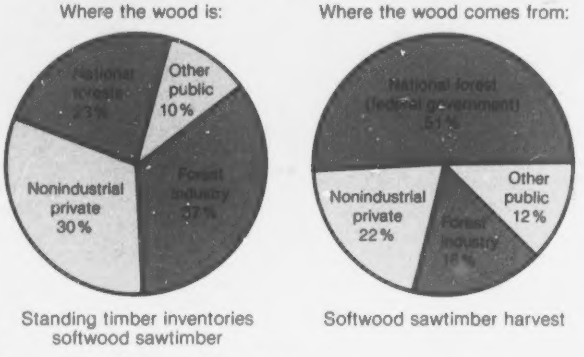
There are other barriers to forest management. A survey taken in the U.S. South in 1983 found that of the landowners interviewed, 88% were more than 65 years old, 24% were retirees, and 40% had annual incomes of less than $25,000—difficult prospects for forestry investments with delayed returns.

Industry cannot expect yields from small landowners' property to equal those from industrial forests, given industry's greater share of high-productivity sites and ready access to intensive tree-growing technology. Many small landowners will continue to rely on relatively simple management practices that are less intensive than those used on industry lands.

FOREST MANAGEMENT CHOICES. Opportunity exists for improved management but there is no consensus on how to obtain it. Some companies assume that the marketplace will provide the necessary incentive. These companies aggressively buy stumpage when they want it, at the price it takes to get it, but have opted out of the persuasion business on forestry.

Other companies are directly involved in improving the management of these lands. The major industry ef-

FIGURE 1: **Breakdown of standing softwood sawtimber inventories and harvest.**



Standing timber inventories softwood sawtimber

Softwood sawtimber harvest

Source: National Forest Products Assn.

FIGURE 2: **Private nonindustrial lands productivity: wood consumer goals compared with Resources Planning Act of 1980.**

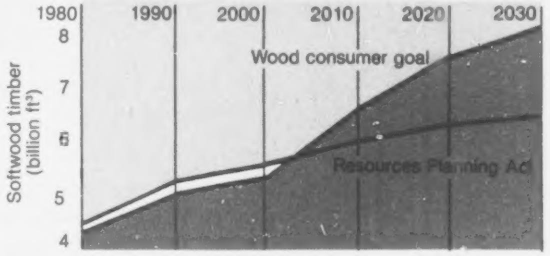


Chart courtesy of National Forest Products Assn.

fort is in the South, through leasing and management assistance. The most recent information, covering nearly 70 companies, shows corporate involvement in managing the lands of others on a little over 5 million acres, 2% of the small landowner total. The acreage is almost equally split between leases and landowner assistance programs. Nearly half of the companies surveyed plan to expand their activity in this area. The majority of the remaining companies expect to maintain their activity. Leasing is on the decline, and management assistance is on the rise.

Landowner assistance programs are based on corporate commitment, through direct involvement of company personnel to persuade and assist landowners to intensify forest management on their lands. At the most basic level, this may be only verbal advice from a company forester to a landowner. The advice may include distribution of literature on how to get government cost-sharing payments, how to take advantage of tax incentives, how to find consulting foresters and contractors for timber stand improvement, and how to plant trees.

At the next level of involvement, some companies will do the reforestation job, either with their own equipment or with contractor equipment, at cost, with no charge for developing a management plan, professional advice, or administration of reforestation work. In some cases, this assistance may involve a negotiated agreement for a first right of refusal on the eventual timber sale.

High levels of involvement offer other options. A participation lease or one-rotation lease is an arrangement whereby the company bears all the costs of reforestation. In an annual rental situation, the company bears the cost of reforestation, pays a rent that is adjusted on a regular basis of inflation, and receives the harvest from the landowner.

In most cases, future harvests will be purchased either through a one-on-one negotiated agreement with the landowner or by competitive bidding. The real value of company landowner assistance programs is the inside track gained by fostering a sustained relationship with the landowner.

Most companies with landowner assistance programs find it to be a reasonable companion to the more capital-intensive programs on their own land. There are additional benefits. Neighbor-to-neighbor good community relations invariably lead to immediate returns in terms of increased stumpage acquisition. Satisfied landowners recruited into the American Tree Farm System are often "adopted" into individual company's landowner assistance program. They are often sympathetic to the company's local, state, and national government relations goals and can be very valuable allies.

STRATEGIES EXPLAINED. Companies that have a strong corporate commitment to assisting landowners do so for strategic wood supply purposes. Some of the methods they use for success in this commitment are explained below.

Reforestation assistance is most effective at the time of harvest. It is most economical to replant pine immediately following harvest, and this is the time the landowner has funds available to spend on reforestation. The bond of trust established between the company and the landowner because the harvest has been done in an acceptable fashion can logically be extended to reforestation and even to the next timber sale.

The program needs to be a full-time activity, completely coordinated with wood procurement. Regular contact between the landowner and the forester must be maintained on a one-to-one basis. Demonstrations, advertisements, literature, and radio and television spots can pique a landowner's interest but are no substitute for quality service on the ground. The service has to be given when and how the landowner wants it and must be designed to meet his or her objectives. Individuals do not make personal investment decisions based on the advice of a broker they do not know and trust, and the same can be said for any landowner investing his or her capital in forestry.

One wonders why more companies aren't involved in private forest assistance. Why are industry-landowner assistance activities being performed on only 3 million acres, only 1% of the small landowner forest acreage in the country?

In many cases, corporate motivation simply is not present. In a survey of 110 forest products companies, only 33 required their foresters to discuss regeneration alternatives with landowners when the company purchased their timber. Two thirds of the company officials surveyed believed that reforestation of private timberlands is not a priority or should be motivated by either

FIGURE 3: **Planting and seeding on private, nonindustrial lands in the U.S., 1952-82.**

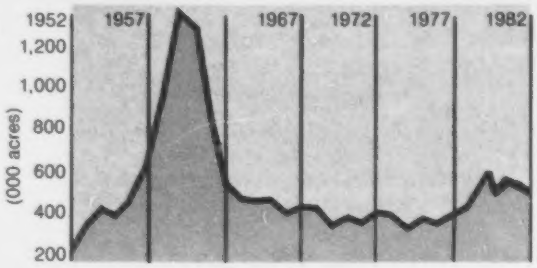


Chart courtesy of National Forest Products Assn.

government agencies or trade associations.

Direct contacts with landowners for stumpage purchased by pulp and paper company employees account for less than a third of the volume harvested in the South. In most areas, the majority of contacts are made by timber dealers or loggers. Unless there is a workable referral system to a company forester, the timber buyer is not likely to give priority to reforestation. This is unfortunate because the timing is right, the bond of trust for the harvest has been established, and this opportunity soon may be lost.

Industry is not the only management assistance delivery system. Some large-acreage owners hire consulting foresters, and many states provide public employees to do the job. Industry programs are only a part of the overall delivery system.

After motivating the landowner to reforest, the second step, from the landowners' point of view, is how to finance it. Shall some of the harvest proceeds be dedicated to reforestation? Many landowners do this but many will not unless they get some help.

Some assistance is available from government forest management incentives, or cost sharing. The federal government provides $25 million a year in cost sharing, generally on a 50:50 basis. Several states have similar cost-sharing programs. There is a difference of opinion within the industry over the relative value of cost-sharing programs, for reasons too numerous to discuss in this article.

Forest owners themselves rank cost sharing first among incentives to practice forest management. With agricultural subsidies running $20 billion a year, forest landowners are pleased with a modest $25 million of forestry cost sharing. Landowners also appreciate tax breaks, and surveys show they would like even better tax incentives than are now available.

Company foresters who deal daily with landowners report that for many of them, cost sharing is essential to the decision to reforest. Ten years of federal cost sharing have resulted in 2.5 million acres of reforestation and timber stand improvement.

What happens if the achievable opportunities for increasing the productivity of nonindustrial private forests are not met? There aren't any clear answers, except in the pine forests of the South. The best that can be said is that much of the uplands that aren't reforested to pine will revert to hardwoods, which have one fourth to one third the growth rate of pine. These stands will need an extra decade or two until the next harvest, and they are not as efficient to harvest.

SUMMARY. Nearly 60% of the commercial timberland available to generate the future wood supply is owned by 8 million private individuals. Future yield from most landowners' tracts will not approach yields expected from large-scale industrial lands.

Direct company assistance to landowners is a useful strategic policy for those companies committed to a quality, on-the-ground program. It gives a competitive edge today and should be a greater advantage in the future. These programs are not just an exercise in social responsibility or public relations. They are a practical part of the ongoing wood procurement effort, and they strengthen current fiber procurement in many cases. More important, when company-owned lands reach their capacity to produce, landowners' wood is the only supply to support major expansions in the domestic and export markets.

Logging or harvesting are still the most significant management practices that occur in any forest. If logging is accomplished with the future forest in mind, future forest growth and productivity will be positively affected, and financial yields to landowners will be greater. Much more can be done to promote the independent contractors' positive involvement in reforestation.

The solution to small landowners' forestry problems does not lie with national trade associations, nor will it be resolved by corporate discussions. It is a highly localized matter that requires forester contact with landowners. The structures and vehicles for coordinated action are already in place in state forestry associations and the American Tree Farm System.

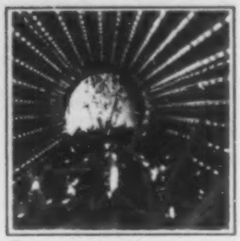
There are mixed perceptions of the Tree Farm Program. It continues to recognize landowners who are forestry leaders, and it is an outstanding vehicle to talk forestry to the public. But in may states the local Tree Farm committees, sponsored by the state forestry associations, are the front line in selling forestry to all landowners. Where progress through those bodies is lacking, it is because industry commitment and support are lacking.

Second, two thirds of the time industry is missing the sale when the current crop of trees is cut. Brochures, advertisements, and gimmicks are no substitute for direct sales. Once the trees are gone and the money is spent, reforestation is a tough sell. If the forest product companies want to sell reforestation, they must become good salespeople.

Finally, the commitment must become part of a company's culture if it is to be sustained. This requires individual commitment. Efforts to achieve customer satisfaction, product quality, and production efficiency do not come without senior management commitment, and there is no reason to believe landowner assistance is any different. ■

This article is published courtesy of the American Pulpwood Assn. Inc. (APA), a nationwide, nonprofit trade association responsible for the issues that surround the safe and efficient harvest and transportation of forest products from the woods to the mill. APA members include the nation's pulp and paper mills, wood dealers and independent logging contractors who harvest and transport pulpwood and timber, and equipment companies that manufacture pulpwood and timber harvesting and processing equipment.

APA's fifty-first annual meeting was held in Washington, D.C., Mar. 17-19, 1985. The theme, "Fiber Supply Outlook," focused the general session presentation on future wood supply issues.



PULPWOOD
PROCESSING

U.S. pulpwood cost outlook is good,

Most areas will have no problems with near-term pulpwood supplies; prices should be stable in all but the South, where a small rise is foreseen

■ The five forested regions of the U.S. provide the majority of the wood supply for the domestic pulp and paper industry. These five regions are the Northeast, the Appalachians, the Lake States, the West, and the South. Each region has unique factors that affect wood supply, costs, and procurement patterns. This article will discuss the cost of pulpwood and variables that will influence costs over the next few years.

The five regions differ in land ownership and in volume requirements for pulpwood. Several tables are included in this article to help quantify the differences in comparative terms. Table 1 illustrates regional land ownership pattern differences and sets the stage for later conclusions about the supply of standing timber. Note that nonindustrial private forest (NIPF) owners are important in all regions but the West.

Table 2 shows differences between the five regions in wood consumption by species and in pulpwood consumption. It also shows the concentration of softwood consumption in the South and West.

With such varied conditions, the relative wood cost component of pulp production can be expected to vary, and it does. Table 3, developed from American Pulpwood Assn. (APA) estimates, shows the percentage contribution of delivered wood costs to the cost of pulp at the paper machine wet end for 1983. The variations between regions are interesting features of Table 3. Delivered wood costs in the South are a higher percentage of pulp cost, not only because of the higher cost of softwood but also because mills in the South tend to be larger than those elsewhere and produce more unbleached pulp. Economies of scale and less bleaching result in lower mill costs. Wood costs that range from a third to more than half of the cost of producing pulp are significant, as these costs can affect the future viability of the industry.

Table 4 has the 1983 percentage data on wood costs shown in Table 3, but the corresponding 1973 data and the reduction in cost percent during the ten years between them is also included. The proportion of pulp cost attributable to delivered wood has decreased, and in some cases the decrease has been substantial. This reduction, however, is primarily a result of increases in mill energy costs. Delivered wood costs have increased at or below the rate of inflation. Improvements in logging efficiency have increased at or below the rate of inflation and have helped curb increases in wood costs during this period.

Form and source also affect cost. Table 5 lists "roundwood," meaning sections of trees in lengths ranging from four feet to the whole tree stem. The "chips" category refers to those chips produced at locations remote from the pulp mill, generally as residues from lumber and plywood manufacture. This category also includes chips produced at satellite chipping facilities.

Company-owned and leased lands are controlled sources for roundwood. The NIPF listing indicates roundwood from small, nonindustrial private forest owners. Public sources are federal and state government-owned lands. "Controlled chips" are those produced by sawmills owned by or under contract to the pulp company, and "open market chips" come from sawmills indepen-

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This article is based on a roundtable presentation by three forest industry executives: C.P. Nielsen, vice president, Forest Products Group, Owens-Illinois Inc., Toledo, Ohio; C.R. Mordecai, general manager, Woodlands Div., Union Camp Corp., Savannah, Ga.; and Ralph Peinecke, vice president of Timberland Resources, Boise Cascade Corp., Boise, Idaho.

TABLE 1: **Ownership of commercial forests.**

	Regions				
	NE (%)	AP (%)	LS (%)	S (%)	W (%)
Industry	31	6	8	19	11
Public	6	12	39	9	69
NIPF*	63	82	53	72	20

*Nonindustrial private forests

TABLE 2: **Pulpwood consumption (million cords).**

	Regions				
	NE	AP	LS	S	W
Softwood	4	1	2	38	14
Hardwood	2	3	4	10	1

regional supplies appear adequate

dent of the pulp company.

Examining the fee and leased-land roundwood line in Table 5 shows a heavier dependence on these lands in the Northeast and South, where the major corporate landholdings are located. Roundwood from nonindustrial private owners is of the least significance in the West, and public ownership is an important source in both the Lake States and the West. The heaviest integration of pulp and solid-wood products is in the South and the West. Controlled chips are important factors in those regions.

Table 6 shows the delivered cost of roundwood divided into components for the same regions appearing in Table 5. Stumpage here is shown at fair market value, which means that stumpage from controlled sources not competitively priced is stated at prices equivalent to those paid to landowners on the open market. As might be expected, in New England, the Appalachians, and the Lake States, the stumpage cost component is smaller than that in the South and the West because of fewer competitive forces, lower tree values, and a heavy hardwood component.

Harvesting costs include all functions from felling to loading on board trucks. Harvesting costs in the South are favorable in comparison to those in other regions.

Transportation and road costs include all modes: truck, rail, and in a few cases, water and the road construction and maintenance costs associated with trucking. Again, the South has favorable costs.

Other costs include wood procurement and forest management personnel and equipment costs as well as all other woodlands department overhead and taxes.

Often the focus on wood supply costs and their relation to the future competitiveness of the industry centers on the cost, quality, and quantity of standing timber. Table 6 shows that harvesting and transportation account for 50% to 80% of delivered roundwood costs. These cost components also need major attention.

Wood supply characteristics vary far more between mills within a region than they do between regions. Therefore, these data and conclusions may not fit any given mill.

CHIP COSTS. Most chips delivered to a mill are residues from lumber production, and there is little point in tracing sawlog stumpage and transportation costs through to the residue chips. Chip costs are basically debarking, chipping, and handling costs at the sawmill or plywood plant, plus transportation cost to the pulp mill.

Purchased chips are generally the least costly form of pulpwood supply, and there is no reason to expect change in the foreseeable future. Chip supply problems arise with the cycles in lumber and plywood production, which seldom match the paper cycle. This lumber and plywood market imbalance is strongest in the West and South and has minimal impact in other regions. Reduced harvest levels from federal lands in the West will eventually be felt in the pulp log market.

ROUNDWOOD COST PREDICTIONS. No problems are expected in the Northeast at this time as the supply is more than adequate. Those companies that have lost appreciable softwood volumes to the spruce budworm will have to use more hardwood in the future. Very little expansion is planned in the region. The use of wood for home heating is increasing, and there are prospects for the use of more wood for industrial fuel. However, such developments do not present a critical supply issue in the immediate future.

It looks like a buyer's market for Appalachian hardwood. A number of Appalachian mills also bring softwood from the South, and much of what pertains to the South applies to these mills as well.

In the Lake States, supplies of aspen—the predominantly used species—continue to look favorable, and no immediate problems seem to be forthcoming, although

TABLE 3: **Wood cost as a percent of pulp cost (1983).**

	Regions				
	NE (%)	AP (%)	LS (%)	S (%)	W (%)
Delivered wood	39	29	35	57	41

TABLE 4: **Wood cost as a percent of pulp cost (1973 and 1983).**

	Regions				
Delivered wood	NE (%)	AP (%)	LS (%)	S (%)	W (%)
1973	47	30	43	65	44
1983	39	29	35	57	41
	−8	−1	−8	−8	−3

there are some hot spots of competition.

Western orientation toward solid wood and heavy dependence on purchased chips will keep pulpwood stumpage cost from becoming an important consideration over the short term.

The South is the only region where there is strong agreement that stumpage costs will be increasing. In a poll of American Pulpwood Assn. board members, half of the southern respondents said that stumpage cost increases had been the most significant economic component during the last ten years, and 60% said this would continue through the next five years. The basic reason is competition. There are also some hot spots, southern Georgia being the hottest, but competition is also very strong in other locations along the Atlantic Coast and the Gulf Coast.

For the rest of the 1980s, stumpage costs will probably not increase at the rate sustained during the last 10 to 15 years, and it is quite likely that the rate of increase will be less than that experienced in the past.

This assumption is based to a large degree on the current pessimistic forecast for housing starts, the likelihood that Canadian lumber will hold its current share of domestic markets and the probability that the export picture will not dramatically improve.

LIMITS TO UTILIZATION. The future will not be like the past. In the South, a number of events have occurred favorable to timber supply. Shifts in agriculture led to farm land abandonment, and fields often naturally seeded into pine stands. Increased forest fire protection was another such event, and the Soil Bank program, which paid farmers to pull marginal agricultural land out of production and plant it with trees, was still another. These events are unlikely to recur.

Other significant events, particularly for company-owned and controlled lands, were improved mechanical site preparation and controlled burning, forest fertilization, and genetics, all leading to increased yields from planted pines.

During past years, the degree of tree utilization has been improved, and more of the tree is being taken out of the forest. This has helped considerably in keeping costs down. However, tree-length harvesting is about as much as can practically be done with pine. As tree-length logging increases, it too will eventually reach its maximum practical application.

Technical improvement in residue chip production—chipping the whole tree, bark, leaves, and all—has some additional future promise, but use of this material is still constrained by its low quality for pulping. Stumps are another potential source of fiber, but ways must be found to get rid of the abrasive sand and grit. More hardwood is being used, a trend that will probably continue.

TABLE 5: **Effect of wood form and source on cost.**

	Regions				
Wood form/source	**NE (%)**	**AP (%)**	**LS (%)**	**S (%)**	**W (%)**
Roundwood					
Fee/lease	21	17	15	24	12
NIPF	53	50	44	34	5
Public	1	1	19	1	18
Chips					
Controlled	1	6	7	16	23
Open market	24	26	15	25	42

SUPPLY/DEMAND PREDICTIONS. Although the Forest Service has predicted doubled wood demand 50 years from now, industry managers, perhaps better tuned to past experience, domestic markets, and three-to-five-year business cycle horizons, are really not convinced. Periods of supply imbalance in the past were brief and were caused by logging contractors' inability to increase production rather than by a shortage of standing timber. If the pulp and paper industry's objective is to become a large factor in pulp and paper exports, it should be more concerned about increasing the wood supply 15 to 20 years in the future.

Planning is dependent on data, and the USDA Forest Service provides Forest Survey information in all regions, based on periodic remeasurement of thousands of permanently established statistical sample plots in the forests. Funding cuts lengthened the southern remeasurement cycle from once every 10 to once every 13 years. With pulpwood trees becoming merchantable in 20 to 25 years, 13-year-old data are not acceptable for substantiating mill expansion studies.

In the fall of 1983, the APA board of directors recommended action. Funds for reductions of the Southern Forest Survey cycle received congressional approval in late 1984. Cycle time reductions for other regions were also achieved.

On the demand side, the APA has been making five-year forecasts of southern pulpwood requirements for 20 years. These have proved statistically reliable in the long run and serve as an early warning guide. Good data on a timely basis for the South permit faster response. An eight-year resurvey cycle for pine is adequate for early warning.

About ten years ago, Virginia was faced with a timber growth/drain deficit. Spurred by industry and funded by an industry-accepted tax on harvest, the state planted trees in nonindustrial forests and reversed the drain. A similar initiative is now underway in several states. With most industry forests almost fully planted and growing close to capacity and with the public ownership contribution being minor, the opportunities are on nonindustrial private forestlands.

Only a comfortable surplus provides absolute security, and there is a question as to whether state-level action will be adequate. The perfectly managed forest would have equal acres in each age class through to maturity, but the reality of diverse ownerships and shifts in demand means that age classes are not going to be even. In low age class yield periods, some softwood will be harvested prior to reaching optimum size, and some hardwood substitutions will occur. States where supply deficits are identified will not be prime targets for expansion of mills. It is even likely that there will be some over-response in some areas, providing peaks in softwood timber supply.

HARVESTING/TRANSPORTATION COSTS. Harvesting and trucking pulpwood in the U.S. is predominantly performed by tens of thousands of small businessmen and women, independent of the companies that purchase their product or services. Logging by crews on pulp company payrolls is done by some companies but is responsible for only 5% or less of overall production.

Reliance on independent contractors gives the U.S. a significant cost advantage over other countries that get substantial supply from company operations. Canada, long highly dependent on company operations, is now strongly shifting to the use of independent contractors.

Over the next 20 years the independent operators will supply industry's needs only if they flourish economically. This means they must attract labor with adequate wages and benefits, provide a safe work environment, and increase labor productivity with training.

Independent contractors provide mills with a buffer on purchase volumes. When supply at the mill exceeds requirements, deliveries can be curtailed, and when more wood is needed, contractors are usually flexible enough to increase production to meet that need, up to a point. The elasticity of these small operations to increase production is finite, and the root cause of every pulpwood crunch we've experienced has been the inability of independent logging contractors to harvest and haul roundwood in excess of their capacity.

The primary cost issue in harvesting and hauling rests on the continuing independence of the relationship between pulpwood consuming mills and independent logging contractors. The principal challenges to this independence historically have come from the Internal Revenue Service's efforts to ensure full collection of income tax withheld and Social Security taxes. The IRS has attempted to transfer this responsibility to large corporations. After a three-year campaign in Congress, a very satisfactory solution has been achieved. However, in future years, if the IRS is able to prove to Congress that important revenue losses are inherent in the independent contractor system, the issue could be reopened. Labor union attempts to set aside the independent relationships for purposes of building units large enough to be administratively profitable have been random occurrences through the years, but there is currently no movement in progress.

When the APA board of directors was asked to rank the cost increase picture for the last ten years and predict the next five years, they found it clear that harvesting cost increases had minimal impact in the past. However, nearly 80% of APA board members felt that harvesting costs will increase at a higher rate in the coming five years. During the recession, harvesting costs remained flat or even declined. Reduced consumption levels maintained a buyer's market for pulpwood, and as the economy shifts to a seller's market, price pressure in harvesting is certain to occur. Demand will fuel the process, but the major harvesting cost increase will be based on logging and trucking equipment costs. During the recession, as the sales and profit pictures of the manufacturers of harvesting equipment and trucks dramatically show, loggers deferred equipment purchases. That situation has turned around, as have the prices for this equipment as well as the interest rates and carrying costs.

Eighty percent of APA board members also said that transportation was the cost area over the last five years that had experienced the highest overall rate of increase. Most of the increase was fuel-related, but some was tied to increases in truck equipment costs. Rail transportation, because it is most significant in the South, generated an overriding southern transportation cost increase. Rail deregulation has had dramatic cost consequences for many southern mills. Strategy to overcome the cost impact of higher rail rates, restrictions to the numbers of cars in the fleet capable of hauling short-length pulpwood, and the abandonment of unprofitable lines has forced many changes in wood procurement strategy. Company forestlands that were once considered strategic at long distances from the mill have lost some of that distinction. Measures to ensure the future supply of standing timber within favorable truck haul distances have been major factors in recent southern pulpwood procurement realignments. Decisions affecting company landownership and forest management assistance to nonindustrial private owners have, in recent years, been increasingly transportation cost driven.

However, the major transportation cost impact is probably behind us for the moment. Of the same APA board members who gave an 80% ranking on transportation cost increases during the past 10 years, only 20% feel that additional pressure in this component will occur during the next five years.

WORLD COMPETITION AND PUBLIC POLICY. How competitive is the U.S. compared with other countries that have significant forested regions? The industry is presently very competitive and has the talent to remain so. However Brazil, South Africa, Australia, New Zealand, and other countries have strong emerging industries based on highly productive land, advanced technology, and relatively low-cost labor. To remain competitive the pulp and paper industry must be prepared to compete.

While the cost-driven factors affecting wood supply on a regional basis have been covered with only passing reference to the impact of public policy, the pulpwood side of the forestry and harvesting community has fared reasonably well in the federal public arena. To a large extent, this is due to effective collective action through the trade associations that represent the industry at the federal level. With some exceptions in specific states, the industry has held its own at the state level. In the next several years, it is likely that critical public policy decisions will be made at the state level, and in some states, at the county and township level. These will have to be addressed, and the industry will probably have to concentrate its resources more strongly than ever at the state and local level. ■

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TABLE 6: **Delivered cost of roundwood by component.**

	Regions				
Roundwood cost component	**NE (%)**	**AP (%)**	**LS (%)**	**S (%)**	**W (%)**
Stumpage	11	5	12	27	21
Harvesting	45	43	40	37	40
Transportation	34	26	31	16	30
Other	10	26	17	20	9

BLEACHING: Chemical substitutes, equipment increase efficiency

Consumption. Chemical pulp is whitened by the bleaching agents listed in Tables 1 and 2. The degree of brightness is usually a function of the product involved. Market pulp is at the top of the list while certain bleached board products are found at the lower end. The term "brightness" has recently come under some investigation. CPPA and TAPPI bleaching committees are currently working on a formula to equate the four measurements of whiteness (ISO%, GE, ELREPHO, and SCAN) to eliminate any market confusion.

Chemical consumption by chemical pulp bleacheries has been steady during the 1980s. Cheaper chemical substitutes such as oxygen and peroxide are reducing consumption slightly, but the major chemicals like chlorine dioxide are being shifted in bleaching sequences and becoming substitutes themselves. This results in a higher efficiency in chemical usage as well as an improved product. Dynamic mixing equipment sold to manufacturers is directly responsible for this development. Overall consumption figures will not change much in 1985, with no mill startups scheduled. Last year's mill startups at Great Northern Nekoosa's Leaf River Forest Products, New Augusta, Miss.; Union Camp, Eastover, S.C.; and Crown Zellerbach, Camas, Wash.; lifted consumption. Next year's opening of Champion International's Quinnesec, Mich., mill and possibly another southeastern mill will continue that growth.

Technology in electrochemistry and ozone bleaching and trends toward using mechanical pulp are still major, but not immediate, threats to bleach plant chemical consumption.

TABLE 1: **1984 U.S. consumption of chemicals for the bleaching of chemical pulp (in short tons) with their second quarter 1985 parice.**

Chemical	Bleaching process	All pulp and paper	All industry	Current price
Chlorine	1,489	1,489	11,100	200
Caustic	1,750	2,190	12,000	195
Sodium chlorate	296	296	350	440
Hydrogen peroxide	5	16	117	465[1]

[1] Liquid, 35%, tanks, freight equalized.

TABLE 2: **Bleaching agent action and market information.**

Chlorine	Liquid	100%	Tanks
Chemical action: Delignifies pulp according to dose, temperature, and reaction time.			
Caustic	Liquid	50%	Tanks
	Liquid	73%	Tanks
	Flake	76%	400-lb drum
	Solid	76%	700-lb drum
	Granular	76%	450-lb drum
	Bead	76%	400-lb drum
Chemical action: Neutralizes acids formed in previous stage; helps to remove chlorinated lignins while they remain in alkaline solution.			
Sodium chlorate	Crystal	100%	450-lb drums
	Liquid	100%	Bulk, tank car, or truck
Chemical action: Chief reactant in the production of chlorine dioxide. ClO_2 is specific in its attack on lignin and extractives.			
Hydrogen peroxide	Liquid	35%	Tanks
	Liquid	50%	Tank car
	Liquid	70%	Tank car
Chemical action: Mechanism for whitening is not known; oxidation of carbonyl and to carboxylic groups stabilizes pulp thus reducing brightness reversion.			

Prices. The cost of bleaching pulp fluctuated almost as much as pulp prices during the past 36 months. Chloralkali producers were discounting early in the decade as a result of the recession (decreased housing starts, etc.) and oversupply, but have recently stabilized their prices and are now introducing incremental price increases. Several U.S. producers idled chlorine plants in this period as well. A technological development in the production of chlorine and caustic soda could affect the purchase price. A new coating for cathodes in electrolytic cells has been tested by Dow U.S.A., and results indicate a savings in the voltage used to convert brine. Caustic soda is rapidly eating away the market share of sodium sulfate (saltcake) in pulping operations, bolstering demand.

The sodium chlorate and chlorine dioxide markets have been active as Canadian and U.S. producers continue to form partnerships. These ventures may be due to the cheap Canadian energy used to manufacture chlorate, which influences its price. Imports have been on the rise since 1979. One U.S. producer has announced a large capacity increase for 1987, as has a Canadian producer.

The inexpensive bleaching agents are both abundant and stable. Oxygen dealers are not overwhelmed by the increased use of oxygen in existing plants since this only entails a leased storage facility, vaporizer, and probably not more than 10 lb/ton of chemical applied to the pulp. However, the annual growth forecasted for North America (22%) is seen as the largest of any bleaching agent. Peroxide suppliers will be faced with more competition, both at home and abroad. Plans to build a plant in Quebec are currently taking shape, and two U.S. companies have already announced expansion projects. Chemical pulp bleacheries have been slow to substitute peroxide into their sequence since peroxide was not tied in with the growth of the new dynamic mixers (as oxygen was). The strongest growth area will remain with bleaching mechanical pulps. ■

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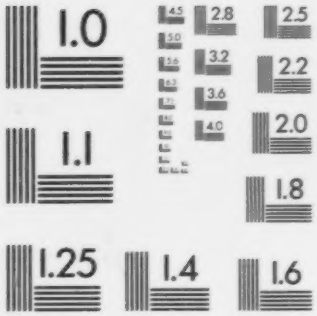
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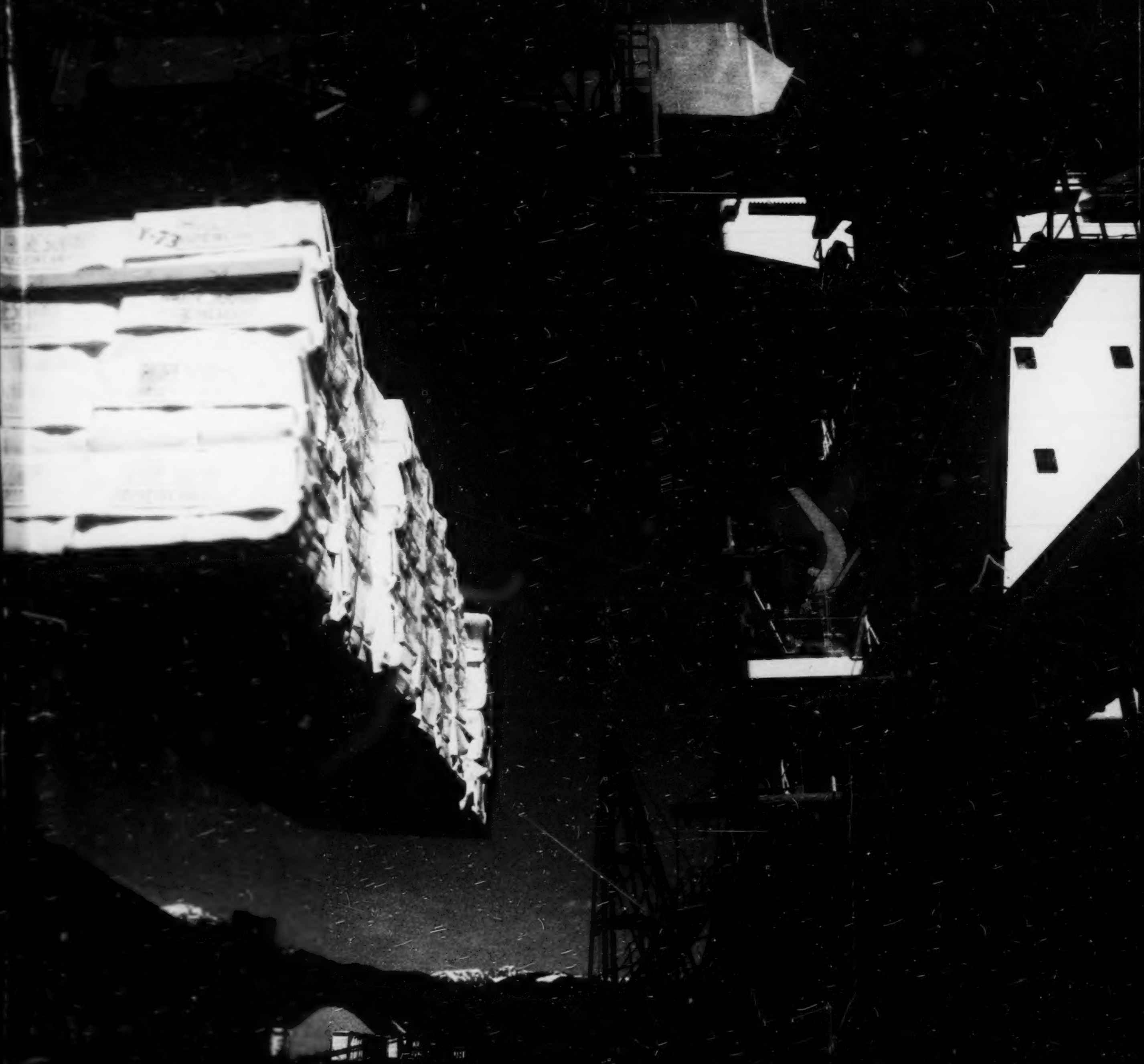
PULP & PAPER

August 1985



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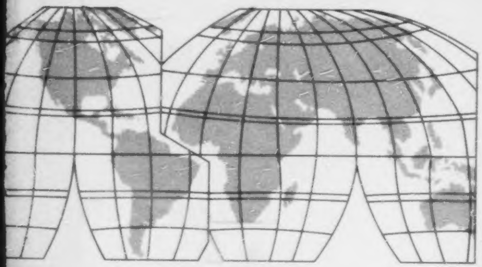

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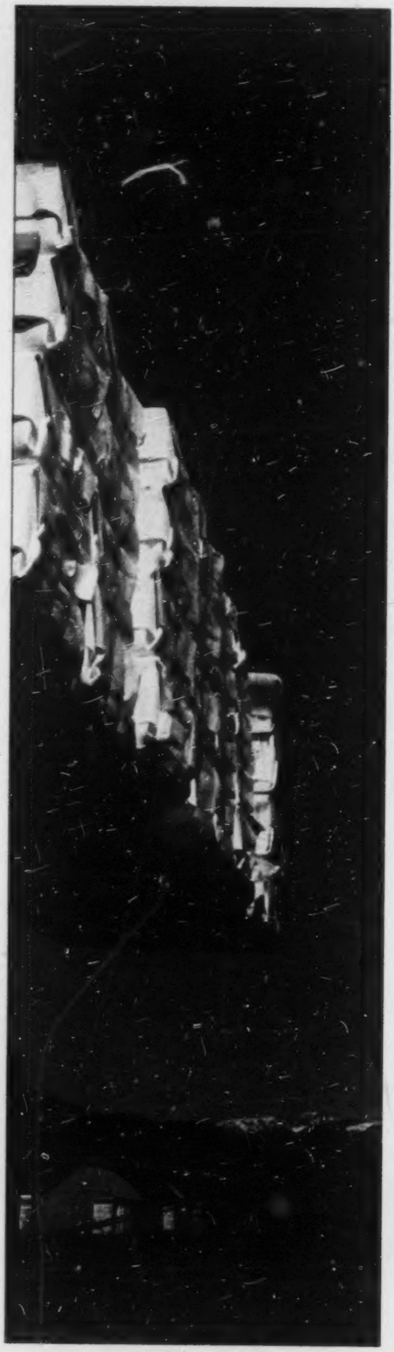

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Market pulp being loaded for export at Canadian Forest Products Ltd.'s Howe Sound Pulp Div., Port Mellon, B.C. (Photo courtesy of Canadian Forest Products Ltd.)

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Office locations

AT = Atlanta: 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339; (404) 432-3186; Telex 275015
SF = San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273
NY = New York: 370 Lexington Ave., New York, N.Y. 10017; (212) 683-9294; Telex 220442
BR = Brussels: Chaussée de Charleroi 123a, Boite 5, B-1060, Brussels, Belgium; Telex 846-24672

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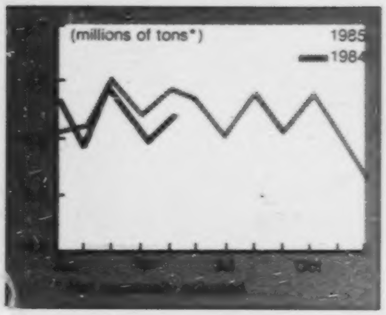
U.S. paper and board production



U.S. production of paper and paperboard totaled 5.68 million tons in May, 4.9% lower than in May 1984, American Paper Institute figures show. The seasonally adjusted rate for January through May stood at 34.1 million tpy for paper, down 0.9% from last year, and 32.5 million tpy for paperboard, down 3.8%. API's two-month moving average is still falling, showing an annual production rate of 64.8 million tons in May. That figure is down 5.4% compared with last year's rate of 68 million tpy, and 4.4% lower than the first-quarter 1985 rate.

Among major grades, printing and writing paper production was even with last year, although shipments were down. Packaging grades fell 9.7%, while kraft linerboard was off 4.8% (and 27.4% in production for export). Only tissue and uncoated free sheet showed gains, rising 2.3% and 2.4%, respectively. Corrugated box shipments declined 3.2% from last year, the Fibre Box Assn. reported.

Canadian newsprint shipments dropped a sharp 12.7% in May, the Canadian Pulp & Paper Assn. said, while operating rates stood at 95%, up from 91% in April. Canadian pulp production dropped 10.8%, with operating rates at 83%. ■

PAPER & PAPERBOARD PRODUCTION[1]

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
Newsprint	May	461	−4.2	5,501	−1.8
Uncoated groundwood (s)	May	123	−8.2	1,485	−7.6
Coated paper (s)	May	494	−7.1	6,270	−.2
Uncoated free sheet (s)	May	810	4.8	9,643	2.4
Other printing/writing	May	112	−11.1	1,349	−9.6
Total packaging and other paper (s)	May	444	−11.6	5,265	−9.7
Tissue	May	440	6.8	4,985	2.3
Total paper	**May**	**2,884**	**−2.5**	**34,498**	**−1.5**
Unbleached kraft paperboard	May	1,419	−8.0	16,557	−4.6
Semichemical medium	May	431	−.9	5,015	−3.2
Bleached paperboard	May	328	−6.3	3,993	−2.9
Recycled paperboard	May	621	−10.4	7,479	−6.8
Total paperboard	**May**	**2,799**	**−7.3**	**33,044**	**−4.7**
Total U.S. paper and paperboard output	**May**	**5,684**	**−4.9**	**67,542**	**−3.1**

PULP, WASTEPAPER & FIBER[2]

Total U.S. woodpulp production	Apr.	4,403	−6.8	54,651	−2.0
Market pulp production	Apr.	564	−4.9	7,020	2.6
Wastepaper consumption at paper/board mills	Apr.	1,246	−6.0	15,419	−3.2
Pulpwood consumption (cords)	Apr.	7,148	−2.7	87,579	−1.0

CONVERTED PRODUCTS STATISTICS[3]

Corrugated box shipments (billion ft^3)	May	22.345	−3.0	112.168[6]	−.4
Containerboard inventories at U.S. box plants and mills	May 1	2,987	−1.2		

INTERNATIONAL TRADE[2]

U.S. paper imports (including products)	Apr.	940	18.4	11,245	14.1
Imports of Canadian newsprint	Apr.	713	27.3	8,254	14.5
U.S. paper exports (including products)	Apr.	351	1.4	4,002	−4.6
Exports of unbleached kraft linerboard	May	145	−22.5	1,590	−27.4
Exports of woodpulp	Apr.	328	31.7	3,749	4.2
Norscan pulp inventories[4]	May 31	1,466	−7.7		
Norscan pulp operating rates[4]	May	80%	81%	90%	87%

CANADIAN STATISTICS[5] *(reported in metric tons)*

Total newsprint shipments	May	742	−12.7	3,753[6]	5.1
Operating rates	May	94%	99%	94%	88%
Inventories held by U.S. consumers	May 31	1,488	17.5		
Other paper/board shipments	May	249	−2.0	1,241	8.3
Woodpulp shipments (export only)	May	583	−3.6	2,794[6]	10.7
Operating rates	May	83%	98%	87%	79%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = shipments.

BLEACHED PAPERBOARD: Oversupply will weigh on market through 1986; pricing unstable

Grade structure: Primary uses for solid bleached sulfate (SBS) paperboard are for folding carton and milk carton stock. SBS is also used for cups, plates and trays, linerboard, and other packaging uses. Bleached boards come in calipers ranging from 10 to 28 pt. in low-, medium-, and high-density levels, available in basis weights 120 to 300 lb/3,000 ft². About half of the SBS produced is coated.

Production/capacity: Production of bleached board was up 3.1% in 1984 to 4.05 million tons, after having risen the year before by 7.1% to 3.93 million tons. As a result, operating rates increased from 95.1% in 1983 to 95.6% last year—nearly as high as the record 96% achieved in 1976. Exports pulled down the market some, falling by 7.1% to 478,000 tons.

By end use, 1984 production of milk carton stock rose 6.3% to 645,000 tons; folding carton stock was up 7.1% to 1.85 million tons; linerboard was up a slight 2.2% to 118,500 tons; plate, dish, and tray was relatively flat with a 0.4% hike to 291,000 tons. Heavyweight cup and rounded nested food containers and cup lids declined a slight 0.2% to 416,400 tons, but other packaging uses were down by a more significant 5.4% to 662,700 tons.

Operating rates were bolstered somewhat last year by only a 2% increase in capacity to 4.2 million tons. Production, however, began to fall in the second half of 1984 as demand slipped and mill order backlogs fell. The Christmas season was slower than expected, leaving considerable inventory on hand by year-end. In addition, exports were hurt by the strong U.S. dollar.

Outlook: SBS markets should be sloppy during the next year or two, with a 6% increase in overall capacity forecast between 1985 and 1987, yielding an extra 252,000 tons, according to the American Paper Institute. API notes, however, that some shutdowns of existing machines should somewhat offset this increase.

Not included in that forecast, though, is Federal Paper Board Co.'s conversion of a partly thermomechanical pulp-based machine at Continental Forest Industries Inc.'s former Augusta, Ga., mill to 100% solid bleached sulfate. The reconfiguration expanded bleached board capacity by about 65,850 tpy.

In addition, Westvaco Corp.'s new 175,000-tpy bleached board machine is slated to come online at the Covington, Va., mill in the first quarter of next year. The company plans eventually to raise its SBS capacity overall by 75% by 1994, but details are not yet firm.

API forecasts SBS capacity will increase by 134,000 tons this year and 118,000 tons over the next two years, reaching 4.439 million tons in 1987.

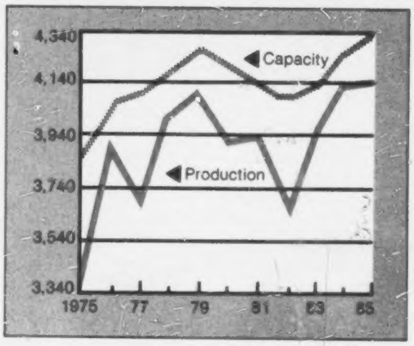
Production is expected to remain flat or decline slightly in 1985 but rise about 5% in 1986, lifting operating rates to about 96.5%. Demand for folding carton and cup and plate stock will rise slightly. Milk carton, though, began a downturn in 1985 that could mark another declining trend, with production off more than 5% during the early part of 1985.

SBS production was down 1.5% compared with the same five-month period in 1984, according to API.

Prices: Recovery in prices began at a rapid pace at the height of demand in the second quarter of 1984. As summer wore on, though, prices softened. Hikes posted earlier in the year began to erode. By year-end, discounting was becoming more widespread, and the range in transaction levels was widening with some spot market prices in the low $500 range. A small amount of tonnage, however, was still selling around $660.

SBS 15-pt coated folding carton board (rolls), $/short ton, year-end: 1973, $300; 1974, $360; 1975, $360/365; 1976, $385; 1977, $405; 1978, $425/445; 1979, $490; 1980, $550; 1981, $625; 1982, $590/625; 1983, $590/625; 1984, $590/665; 1985 (July), $550/665.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1983	1984	1985e
Production	3,926	4,048	4,000
Capacity[1]	4,129	4,187	4,321
Utilization rate	95.1%	96.7%	92.6%
Imports	—	—	—
Exports[2]	515	478	460
Apparent U.S. consumption	3,411	3,570	3,540
lb/capita	33.56	34.24	33.52
GNP ratio	2.56	2.47	2.37

[1] Because of grade switching, capacity utilization is difficult to define.
[2] API production for export.
e = Estimate.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Federal Paper[1]	855	19.8
2. International Paper	810	18.7
3. Potlatch	535	12.4
4. Temple-Eastex	440	10.2
5. Westvaco	420	9.7
6. Champion Intl.	290	6.7
7. James River	219	5.1
8. Weyerhaeuser	200	4.6
9. Gulf States Paper	180	4.2
10. CCA	172	4.0

Market share of top five companies:
70.8%

Market share of top ten companies:
95.4%

Total U.S. capacity (1985):
4.321 million short tons

[1] Bought former Continental Forest Industries' Augusta, Ga., 430,000-tpy bleached board mill in March 1985 and increased the mill's capacity by over 65,000 tpy.

CRUDE TALL OIL: Tight supply of CTO disrupting TOFA price, supply

Production. In 1984, the output of crude tall oil (CTO) was only 2% above the 1983 level. Inventories decreased by 50% for some suppliers after attaining record levels in 1983. Many CTO producers have had periods where two-month backlogs were not uncommon. Meanwhile, the price has skyrocketed above $150/ton in all regions. The reasons are quite plain: unscheduled pulp mill downtime, an increasing amount of woodpulping that does not yield CTO and the somewhat passive attitude of pulp producers toward the CTO fractionating industry.

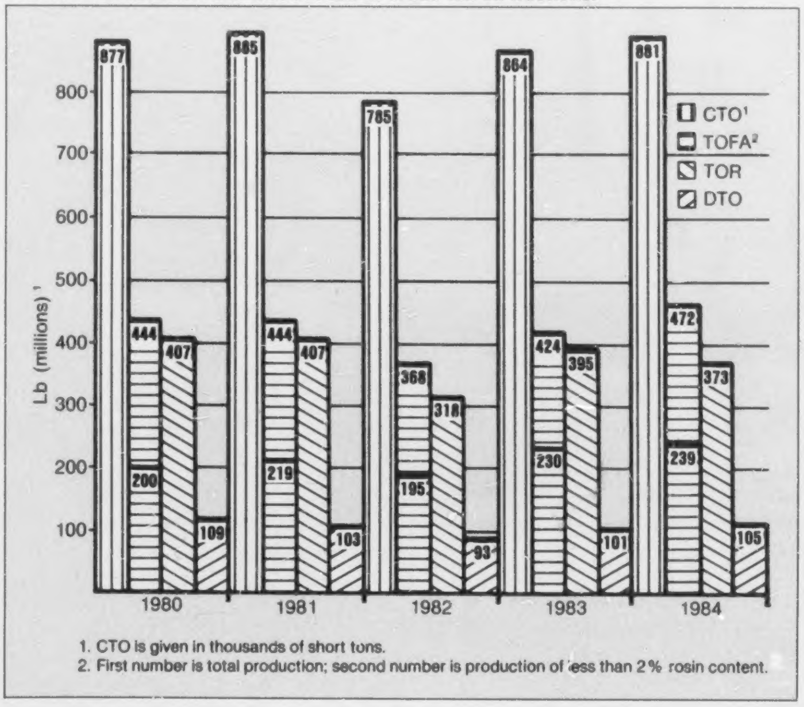
CTO is split into three intermediates that have had divergent market conditions over the past 18 months. Seven fractionators operate in the U.S., processing close to 820,000 short tpy. Tall oil fatty acids (TOFA)—products that contain at least 90% fatty acid—are broken into two classifications: less than 2% rosin and 2% to 10% rosin. The demand for both fractions is strong while supply weakens with decreased pulp production. TOFA is used as an intermediate chemical and as an additive in the production of protective coatings, in ore flotation, and in the production of soaps and detergents. Production of TOFA is at its highest level since 1972, when a record 428 million lb were manufactured. The two types were produced in relatively equal amounts. It should be noted that these records are being set while supply of CTO is short, and consequently, the fractionators have been operating between 75% and 90% of their design capacity. Exports are down 35% since the early 1970s, mostly attributed to declining markets in Europe, Mexico, and Canada, which are now importing from Scandinavian countries. Growth potential is still seen in Asia and South America, where imports have climbed 50% during the last ten years. Distilled tall oil (DTO), containing less than 90% fatty acid, and acid-refined oils are included in these markets, and demand has remained strong through mid-1985.

Tall oil rosin (TOR) has come full circle in this decade, and the worst may still be ahead. TOR stocks are currently at record levels, and the price is falling. Foreign competition involving Portugal, China, and Brazil is taking advantage of the U.S. export market and is looking to expand further into the U.S. domestic market. These countries produce rosin and turpentine by gum fractionation, which is said to be labor-intense. China has been producing rosin since the first century and has the necessary raw materials to become the primary world source if it adopts western methods (i.e., purchases the technology) of production. Brazil, the latest country to enter the rosin trade, is believed to be sending the world market into chaos by proposing rock-bottom prices and increased supply. Major uses for rosin in the U.S. are paper sizing (about a third); rubber and chemical manufacturing (another third); and coatings, ester gum, and synthetic rosin production.

Prices. CTO has increased its dollar value as a result of the short supply. Over the last three quarters, prices have risen over $60/ton. The increased raw material costs for fractionators have forced higher prices on customers. In fact, for the last 18 months all suppliers of TOFA, DTO, and derivatives have added 2 to 9¢/lb to each product at least two times.

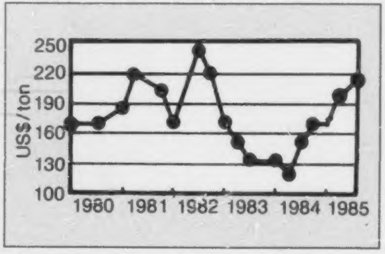
TOR price fluctuations usually concur with those of TOFA but not this year. High inventories, foreign products, and weak demand have leveled prices and forced some discounting. Producer profits have suffered as a result since decreased TOR production holds TOFA output down. The soybean crop, an influence on TOFA and TOR price, has not had any effect this year. Most sources believe new markets may have to be found to rescue TOR products and their prices.

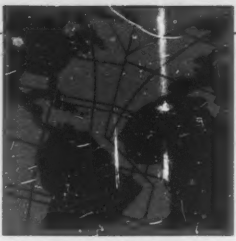
FIGURE 1: **Production and distribution of crude tall oil fractions.**



1. CTO is given in thousands of short tons.
2. First number is total production; second number is production of less than 2% rosin content.

FIGURE 2: **Price history of crude tall oil.**





WORLD REVIEW

The U.S. led world pulp and paper producers to a record year in 1984

Total world paper and paperboard output was nearly 209 million tons; all 26 major producing nations increased their output during the year

By JOHN PEARSON, PETER SUTTON, HUGH O'BRIAN, International Editors

■ The world's paper and paperboard producers set a new record high in 1984. The widespread economic recovery, led by the U.S., pushed up demand so that mills in many of the major papermaking countries ran flat-out for much of the year. Successful price rises and order backlogs were commonplace in many of the world's pulp and paper markets. But during the last quarter, demand began to slacken, and 1985 is generally thought unlikely to bring another big output boost or the record profit levels enjoyed by many companies last year.

Total world paper and paperboard output in 1984 was nearly 209 million tons, 7% up from 1983 and 12.5% higher than 1982's production. Consumption also increased 7% to total 207 million tons.

Broken down into the main sectors, the world made approximately 2.2 million tons more newsprint, 4.4 million tons more of both printing/writing and packaging paper and paperboard, with production of other grades accounting for the rest of the rise. Pulp production increased 6%, reaching 154 million tons, 74% of paper and paperboard output. Of the pulp rise, over 60% was due to higher chemical woodpulp production and nearly 30% to the rise in output of mechanical pulps.

WORLDWIDE IMPROVEMENT. The new record highs set by the world's big producers were the main contributors to the overall increase. But the improvement in demand was, with a few exceptions, worldwide.

World's top 20 producing and consuming countries

PAPER AND BOARD PRODUCTION (000 tons)	1984	% change 1984/83
1. U.S.	62,307	+5.6
2. Japan	19,345	+4.9
3. Canada	14,222	+6.5
4. U.S.S.R.	9,825	+2.8
5. Fed. Rep. Germany	9,157	+10.7
6. People's Rep. China	7,560	+14.3
7. Finland	7,318	+14.6
8. Sweden	6,869	+8.2
9. France	5,566	+5.8
10. Italy	4,714	+10.7
11. Brazil	3,765	+10.2
12. U.K.	3,507	+9.3
13. Spain	2,950	+7.1
14. Mexico	2,240	+8.6
15. Rep. of Korea	2,207	+11.4
16. Taiwan	1,929	+12.2
17. Austria	1,922	+7.4
18. Netherlands	1,885	+8.5
19. Norway	1,562	+14.2
20. Australia	1,559	+7.4

PULP PRODUCTION (000 tons)	1984	% change 1984/83
1. U.S.	50,394	+5.7
2. Canada	20,173	+4.9
3. Sweden	9,240	+6.6
4. Japan	9,127	+3.0
5. U.S.S.R.	8,152	+3.0
6. Finland	8,031	+12.1
7. People's Rep. China	5,352	+13.3
8. Brazil	3,387	+9.3
9. Fed. Rep. Germany	2,222	+6.8
10. France	2,052	+9.7
11. Norway	1,864	+13.7
12. Spain	1,435	+1.6
13. Austria	1,229	+5.1
14. South Africa	1,165	—
15. New Zealand	1,158	+7.9
16. Portugal	1,155	+10.8
17. Czechoslovakia	1,052	+7.7
18. India	1,050	—
19. Poland	878	+0.8
20. Romania	845	—

PER CAPITA CONSUMPTION (lb/year)	1984	% change 1984/83
1. U.S.	633	+7.5
2. Sweden	490	+4.7
3. Canada	441	+6.3
4. Denmark	406	+8.6
5. Finland	397	+7.1
6. Fed. Rep. Germany	388	+10.2
7. Switzerland	384	+6.2
8. Netherlands	377	+8.2
9. Japan	373	+10.5
10. Belgium	355	+5.9
11. Norway	322	+12.3
12. Australia	313	+11.8
13. U.K.	295	+6.1
14. New Zealand	291	−10.2
15. Hong Kong	287	+8.9
16. France	278	+4.5
17. Singapore	273	+29.2
18. Austria	265	+10.1
19. Taiwan	229	+13.3
20. Iceland	207	−8.3

REVIEW OF TOP 27 NATIONS IN PULP/PAPER PRODUCTION

Abridged data on production and export/import trade are given for countries included in the Top 20 tables for paper and board production and for pulp production

Australia

Population: 15,543,000. Per capita consumption of paper and board: 142 kg/ 313 lb. Paper and board mills: 16. Pulp mills: 18 (sulfate: 2; sulfite: 1; soda: 2; semichemical: 4; mechanical: 8; nonwood: 1).

Paper/board capacity: 1,669,000 tons **Pulp capacity:** 1,155,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Newsprint and other paper	569	589	364	n.a.	n.a.	n.a.
Other paper and board	882	961	228	n.a.	n.a.	n.a.
Total	**1,451**	**1,559**	**574**	**722**	**55**	**74**
Total pulp	**618**	**716**	**218**	**270**	**6**	**6**

Austria

Population: 7,551,700. Per capita consumption of paper and board: 120 kg/ 264 lb. Paper and board mills: 34. Pulp mills: 16 (sulfate: 2; sulfite: 8; semichemical: 1; mechanical: 6).

Paper/board capacity: 2,198,000 tons
Operating rate 1984: 87%

Pulp capacity: 1,433,000 tons
Operating rate 1984: 86%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	1,014	1,062	158	203	720	763
Board	775	840	91	99	847	523
Total	**1,785**	**1,922**	**249**	**302**	**1,207**	**1,286**
Chemical woodpulp	850	923	220	222	224	242
Other pulps	319	306	17	19	12	5
Total	**1,169**	**1,229**	**237**	**241**	**236**	**247**

Brazil

Population: 134,000,000. Per capita consumption of paper and board: 25 kg/ 55 lb. Paper and board mills: 164. Pulp mills: 48.

Paper/board capacity: 4,140,000 tons
Operating rate 1983: 85%

Pulp capacity: 3,990,000 tons
Operating rate 1983: 74%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	2,041	2,235	252	180	266	371
Board	1,377	1,530	—	—	139	288
Total	**3,418**	**3,765**	**252**	**180**	**405**	**659**
Chemical woodpulp	3,098	3,387	6	14	1,022	960
Other pulps						
Total	**3,098**	**3,387**	**6**	**14**	**1,022**	**960**

Canada

Population: 25,100,000. Per capita consumption of paper and board: 200 kg/ 441 lb.. Paper and board mills: 107. Pulp mills: 34.*

Paper/board capacity: 15,552,000 tons
Operating rate 1984: 89%

Pulp capacity: 23,846,000 tons
Operating rate 1984: 90%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	11,065	11,767	286	369	8,603	9,210
Board	2,286	2,435	167	197	520	549
Total	**13,351**	**14,222**	**453**	**566**	**9,123**	**9,759**
Chemical woodpulp	11,210	11,422	97	136	6,352	6,114
Other pulps	8,021	8,751	56	56	443	589
Total	**19,231**	**20,173**	**153**	**194**	**6,795**	**6,703**

*Market pulp only.

China, People's Rep. of

Population: 1,036,040,000. Per capita consumption of paper and board: 7.5 kg (e) / 17 lb. Paper and board mills: 1,600e. Pulp mills: n.a..

Paper/board capacity: 7,810,000 tons **Pulp capacity:** 6,650,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	3,570	4,051	—	—	163	147
Packaging paper/board	3,043	3,509	—	—	103	85
Total	**6,613**	**7,560**	**—**	**—**	**266**	**232**
Chemical woodpulp	775	832	—	—	—	—
Mechanical pulp	342	373	—	—	—	—
Reed, bamboo and other pulps	3,608	4,147	—	—	—	—
Total	**4,725**	**5,352**	**—**	**—**	**—**	**—**

Czechoslovakia

Population: 15,481,000. Per capita consumption of paper and board: 77 kg/ 170 lb. Paper and board mills: 49. Pulp mills: 22 (sulfate: 5; sulfite: 5; semichemical: 1; mechanical: 10; nonwood: 1).

Paper/board capacity: 1,370,000 tons
Operating rate 1984: 92%

Pulp capacity: 1,223,000 tons
Operating rate 1984: 86%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	722	715	41	55	98	114
Board	536	548	67	65	86	78
Total	**1,258**	**1,263**	**108**	**110**	**184**	**192**
Chemical woodpulp	771	859	61	50	92	149
Other pulps	206	193	41	43	3	3
Total	**977**	**1,052**	**102**	**93**	**95**	**152**

Finland

Population: 4,884,000. Per capita consumption of paper and board: 180 kg/ 397 lb. Paper and board mills: 46. Pulp mills: 50 (sulfate: 18; sulfite: 7; semichemical: 3; mechanical: 22).

Paper/board capacity: 8,140,000 tons **Pulp capacity:** 9,050,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	4,825	5,707	22	27	4,042	4,735
Board	1,563	1,611	29	34	1,215	1,243
Total	**6,388**	**7,318**	**51**	**61**	**5,257**	**5,978**
Chemical woodpulp	4,379	4,770	13	23	1,315	1,309
Other pulps	2,784	3,261	19	26	257	252
Total	**7,163**	**8,031**	**32**	**49**	**1,572**	**1,561**

France

Population: 540,000,000. Per capita consumption of paper and board: 126 kg/ 278 lb. Paper and board mills: 162. Pulp mills: 25 (sulfate: 7; sulfite: 3; semichemical: 6; mechanical: 9).

Paper/board capacity: 5,500,000 tons **Pulp capacity:** 2,250,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	2,716	2,915	1,248	1,293	729	811
Board	2,547	2,650	1,192	1,269	457	508
Total	**5,263**	**5,565**	**2,440**	**2,562**	**1,186**	**1,319**
Chemical woodpulp	1,457	1,575	1,515	1,517	219	248
Other pulps	413	477	107	108	—	—
Total	**1,870**	**2,052**	**1,622**	**1,625**	**219**	**248**

Total production for all the main regions increased, even if only marginally, and all of the 26 nations that produce over 1.1 million tpy of paper and paperboard increased their output in 1984.

But the most significant indicator of a healthy year was the rise in the output of the U.S., the world's biggest producer (33% of all paper and paperboard) and consumer (36%). Its output was 68.7 million tons, a record high, up 5.6% from 1983. Production records were also set by Japan, the U.S.S.R., People's Rep. of China, Fed. Rep. Germany, Sweden, and Finland, among others.

GOOD START, WEAK END. The major rise in paper and paperboard demand—and consequently pulp consumption—was largely caused by the U.S.-led worldwide economic recovery. With business already improving in 1983, the long shutdown of mills in western Canada tightened up pulp markets, leading to price increases, which were later passed on as paper price rises.

Paper and paperboard price increases went through in many markets during 1984, the result of a rise in demand that, in many sectors, could not be met by mills. In particular, the growing strength of the dollar and strong demand made the U.S. a most attractive market for importers, mainly for printing/writing grades. European, South American, and other producers were quick to take advantage.

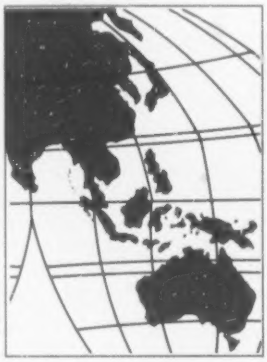
But by late 1984 signs of weakness appeared in several sectors. For example, the dollar's strength plus the effect of planned new capacity was beginning to weaken market pulp prices and North American suppliers. European newsprint price rises, while going through, were being discounted and the big U.S. uncoated woodfree paper market suffered as imports undermined prices.

Into early 1985, kraft liner and market pulp prices were suffering and the high dollar rate resulted in the growth of local currency selling in Europe to the further advantage of Nordic suppliers. The planned U.S. newsprint price rise was set back again and again. And some Far Eastern markets became virtual dumping grounds for pulp and some paper grades.

But several major markets, particularly printing/writing, remained buoyant through to mid-1985, though in most cases not as strong as a year earlier.

NEW PROJECTS AFTER A GOOD YEAR. Following naturally after a good year came a spate of announcements of new capital investment, mainly in new paper capacity, during 1984. The startup of four new pulp mills over 1984 and 1985 in Europe and North America, adding 1.1 million tpy of capacity, meant a reduction in new investment in this sector. New paper capacity led to concern about overcapacity, particularly among EEC producers, who worried that new Nordic output would further weaken markets.

Many of the reports filed by the network of national editors and correspondents for this year's world review reflected uncertainty over the prospects for this year. In general, 1985 appears unlikely to result in much—if any—growth compared with the bumper year of 1984. ■



ASIA/AUSTRALASIA

TOTAL PAPER AND BOARD output in Asia was nearly 38.5 million short tons in 1984, up 8% from 1983. All of the big four producing nations increased their output, but it was the continuing strength of the largest, Japan, which really caused the rise. In another record year, Japan's output totaled 21.3 million tons, up 4.9%.

People's Rep. of China recorded an increase of almost 1.1 million tons to give a 1984 total of 8.3 million tons, while Rep. of Korea's production moved over the 2-million-ton mark, up 11%, and Taiwan's was 2.1 million tons, up 12%. Indian output remained close to 1983's level, at 1.5 million tons.

Most country reports commented on the benefits of the U.S.-led business recovery in 1984 and on the uncertain prospects for this year. It is generally expected that the paper and board industry will run at or slightly below 1984's level, helped by the decline in international market pulp prices.

The increasing importance of secondary fiber was again emphasized by increasing wastepaper imports by Japan, Rep. of Korea, and Taiwan. Asian pulp output was

Production by continents, world total (000 metric tons)

PULP	1960	1970	1980	1983	1984
North America	32,964	54,912	65,969	66,893	70,567
Europe	20,965	34,853	40,235	39,281	41,978
Asia/Australasia	5,156	14,268	18,239	18,441	19,624
Latin America	821	2,224	5,848	5,871	6,322
Africa	124	900	1,502	1,654	1,677
World total	**60,031**	**107,157**	**131,793**	**132,140**	**140,168**

PAPER AND PAPERBOARD	1960	1970	1980	1983	1984
North America	38,917	58,914	70,225	72,334	76,529
Europe	25,634	45,159	59,023	60,518	65,283
Asia/Australasia	7,861	20,621	31,962	34,602	37,314
Latin America	1,656	3,712	7,737	8,023	8,702
Africa	288	892	1,717	1,805	2,083
World total	**74,355**	**129,298**	**170,664**	**177,282**	**189,911**

TOP 27 PRODUCING NATIONS *(Continued)*

Germany, Fed. Rep.

Population: 61,181,000. Per capita consumption of paper and board: 176 kg/389 lb. Paper and board mills: 194. Pulp mills: 37 (sulfite: 10; semichemical: 1; mechanical: 26).

Paper/board capacity: 9,865,000 tons
Operating rate 1984: 93%

Pulp capacity: 2,258,000 tons
Operating rate 1984: 98%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	5,492	6,062	2,718	3,089	1,605	1,885
Board	2,780	3,095	1,221	1,340	784	917
Total	**8,272**	**9,157**	**3,939**	**4,429**	**2,389**	**2,802**
Chemical woodpulp	654	660	2,569	2,579	86	81
Other pulps	1,427	1,562	207	213	28	54
Total	**2,081**	**2,222**	**2,776**	**2,792**	**114**	**135**

India

Population: 683,000,000. Per capita consumption of paper and board: 2.2 kg/4.8 lb. Paper and board mills: 222. Pulp mills: n.a.

Paper/board capacity: 2,165,000 tons

Pulp capacity: 1,450,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Total paper and board	**1,337**	**1,367**	**180**	**135**	—	—
Total pulp	**1,050**	**1,050**	—	—	—	—

Italy

Population: 56,970,000. Per capita consumption of paper and board: 93 kg/205 lb. Paper and board mills: 397. Pulp mills: 28 (sulfite: 2; semichemical: 5; mechanical: 16; nonwood: 5).

Paper/board capacity: 5,300,000 tons
Operating rate 1984: 89%

Pulp capacity: 1,000,000 tons
Operating rate 1984: 81%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	2,468	2,838	835	963	620	835
Board	1,791	1,876	539	639	158	193
Total	**4,259**	**4,714**	**1,373**	**1,602**	**778**	**1,028**
Chemical woodpulp	213	223	1,300	1,511	40	57
Other pulps	574	599	102	122	1	6
Total	**787**	**822**	**1,402**	**1,633**	**41**	**63**

Japan

Population: 120,235,000. Per capita consumption of paper and board: 169 kg/350 lb. Paper and board mills: 593. Pulp mills: 65 (sulfate: 37; sulfite: 5; semichemical: 7; mechanical: 22; nonwood: 3).

Paper/board capacity: 23,495,000 tons

Pulp capacity: 12,519,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	10,932	11,429	402	454	365	379
Board	7,510	7,915	280	242	373	464
Total	**18,442**	**19,345**	**682**	**696**	**738**	**843**
Chemical woodpulp	6,738	7,062	1,515	1,509	43	30
Other pulps	2,122	2,064	657	655	2	9
Total	**8,860**	**9,127**	**2,172**	**2,164**	**45**	**39**

Korea, Rep. of

Population: 40,577,000. Per capita consumption of paper and board: 54 kg/119 lb. Paper and board mills: 170e. Pulp mills: 5 (sulfate: 1; mechanical: 4).

Paper/board capacity: 2,232,000 tons
Operating rate 1984: 99%

Pulp capacity: 307,000 tons
Operating rate 1984: 84%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	1,035	1,119	36	40	52	39
Board	947	1,088	16	22	46	36
Total	**1,982**	**2,207**	**52**	**62**	**98**	**75**
Chemical woodpulp	116	121	453	519	—	—
Other pulps	126	137	59	72	—	—
Total	**242**	**258**	**512**	**591**	—	—

Mexico

Population: 77,500,000. Per capita consumption of paper and board: 29.5 kg/65 lb. Paper and board mills: 65. Pulp mills: 20 (sulfate: 10; sulfite: 1; nonwood: 9).

Paper/board capacity: 3,098,000 tons
Operating rate 1984: 72%

Pulp capacity: 1,068,000 tons
Operating rate 1984: 75%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	1,167	1,284	87	48	25	46
Board	895	966	59	25	4	—
Total	**2,062**	**2,250**	**146**	**73**	**29**	**46**
Chemical woodpulp	414	438	154	198	—	—
Other pulps	345	393	9	14	—	—
Total	**759**	**831**	**163**	**212**	—	—

Netherlands

Population: 14,420,000. Per capita consumption of paper and board: 171 kg/377 lb. Paper and board mills: 33. Pulp mills: 3 (mechanical: 2; nonwood: 1).

Paper/board capacity: 1,992,000 tons
Operating rate 1984: 95%

Pulp capacity: 158,000 tons
Operating rate 1984: 98%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	880	958	1,010	1,129	529	598
Board	857	927	504	550	466	500
Total	**1,737**	**1,885**	**1,514**	**1,679**	**995**	**1,098**
Chemical woodpulp	—	—	521	535	3	6
Other pulps	—	—	28	35	1	1
Total	**147**	**156e**	**549**	**570**	**4**	**7**

New Zealand

Population: 3,230,000. Per capita consumption of paper and board: 132 kg/291 lb. Paper and board mills: 6. Pulp mills: 9 (sulfate: 2; semichemical: 2; mechanical: 5).

Paper/board capacity: 818,134 tons
Operating rate 1984: 93%

Pulp capacity: 1,475,375 tons
Operating rate 1984: 79%

(000 metric tons)

	Production		Imports		Exports	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	410	523	37	28	228	269
Board	259	238	—	—	59	50
Total	**669**	**762**	**37**	**28**	**287**	**319**
Chemical woodpulp	604	592	7	9	219	229
Other pulps	469	565	1	2	251	257
Total	**1,073**	**1,158**	**8**	**11**	**470**	**486**

up only 1.1 million tons from 1983, totaling 19.6 million tons. Imports stayed about the same at 3.85 million.

Including the small export market, these gave an apparent pulp consumption of 23 million tons (wood and nonwood), giving a share of about 60% of paper and board produced. Wastepaper in Japan now provides about half of the raw fiber for papermaking, and this is expected to increase, mostly by raising import levels.

But it was imports of paper and board which stirred strong reaction from some major foreign suppliers, particularly the U.S., where there were claims of trade barriers. The Japanese government is reportedly planning to open up the domestic market further.

It is the big four that are also carrying out most of the capital investment, though others, such as Indonesia (which hopes to become self-sufficient in newsprint in the next few years), Turkey, and Pakistan, are planning or completing significant new projects. Even Nepal is beginning to start its own industry.

There are more and more signs that People's Rep. of China is carrying out a major modernization of its pulp and paper industry, ordering both new and secondhand machinery from abroad. Both Taiwan and Rep. of Korea are completing big expansion phases. Eight projects were finished last year in Taiwan, and nine new paper machines are to start this year in Rep. of Korea, most of which will add new production capacity.

Despite agreed limitations to new capacity, many Japanese mills are carrying out modernization programs, largely replacing aging production lines. Many paper producers are also moving strongly into coated grades.

In India, two new newsprint mills started up last year and several definite projects are going ahead. But India also reflects some of the continuing difficulties faced by many pulp and paper mills in Asia: increasing energy prices and uncertain power supply, higher raw material costs, and labor unrest. Other widespread problems include difficulties in obtaining foreign exchange to buy materials, rising inflation, and interest rates.

Pulp and paper producers in both Australia and New Zealand enjoyed strong recovery in 1984. In Australia, higher demand was reflected by a per capita consumption increase from 280 lb/head in 1983 to 130 lb. Total Australasian paper and board output was up 9.5% at 2.55 million tons, while pulp production climbed nearly 11% to 2.06 million tons.

LATIN AMERICA

THE CONTINENT'S ECONOMIC problems did not lessen during 1984, with many of the countries struggling to keep inflation below 50% and some with inflation running into four figures. The rescheduling of international debts continued to be an international cause for concern. These problems, added to political instability in some major countries, meant that investment capital was somewhat restricted and had to be generated from profits of individual firms.

The strength of the U.S. dollar and continuing high interest rates had a double-edged effect: while they increased the debt burden of Latin American countries they also allowed the countries to enter export markets effectively as low-cost producers. Nowhere was this more true than in the market pulp and linerboard sectors, where producers—especially in Brazil—were able to effectively undercut Nordic and North American suppliers to the European market. The EEC linerboard market was particularly attractive because its minimum pricing policies, which were binding for U.S. and Nordic suppliers, did not extend to Latin American producers.

Total Latin American paper and board output rose by 8.4% during the year, reaching 9.6 million short tons. Brazil was by far the biggest producer, with an output of 4.2 million tons, followed by Mexico with 2.4 million tons. Paper and board exports soared to 995,380 tons—an increase of over 50% compared with 1983. Again Brazil was mainly responsible for the rise, accounting for 726,416 tons of the total.

Pulp production was up 7.7%, to 6.9 million tons, with Brazilian production rising by 9.3%, to 3.7 million tons, and Chile's output increasing 5.4%, to 924,830 tons. But exports from the continent fell by 3%, to 1.65 million tons, reflecting increasing demand from new papermakers inside Latin America.

Several of the projects scheduled to start up during the year were postponed due to lack of funding or government problems. But in Brazil, the 151,000-tpy Pisa newsprint mill started up in December, and in Mexico, Kimberly-Clark de Mexico SA started its 49,600-tpy, 5.3-m-trim tissue machine. Several of the new projects originally scheduled for 1984 startup are now expected to be commissioned in 1985 or early 1986. These include the El Rancho pulp mill in Guatemala, and Papeles Sud America's 110,200-tpy packaging paper mill in Chile. Compania Suzano and Champion Papel e Celulose SA have started new printing/writing paper machines adding 165,345 tpy to Brazil's capacity in these grades.

In Argentina, Celulosa Puerto Piray is due to start up its 154,300-tpy kraft paper and corrugating medium mill next year. Other projects will probably be seriously delayed by the country's severe economic problems.

Pulp producers in Chile are all planning capacity increases. While some of these amount to removing production bottlenecks, other major studies are underway that, in at least one case, will explore doubling capacity.

Brazilian producers are also planning major pulp capacity increases for the late 1980s and 1990s. These include a doubling of capacity at Aracruz Celulose SA and Cenibra, and new pulpwood plantations at Riocell.

Despite the continent's economic problems, it seems likely these projects—with funding partly based on existing successful operations, partly on state and private investment—stand a good chance of coming to fruition.

WORLD PULP, PAPER, AND BOARD

	Population (1,000)	Number of mills		CAPACITY (1,000 m tons)		Per capita (lb)	CONSUMPTION (1,000 tons)				PRODUCTION (1,000 m tons)			
		P&B	Pulp	P&B	Pulp		P&B		Pulp		P&B		Pulp	
							1983	1984	1983	1984	1983	1984	1983	1984
EUROPE														
Belgium	10,000	15	3	919	345	355.0	1,499	1,609	620	616	837	858	328	335
Denmark	5,116	6	3	375	135	406.0	867	942	178	180	319	352	111	127
France	54,000	162	25	5,500	2,250	278.0	6,517	6,809	3,273	3,429	5,263	5,566	1,870	2,052
Germany, Fed. Rep.	61,181	194	37	9,865	2,258	388.7	9,822	10,784	4,743	4,879	8,272	9,157	2,081	2,222
Greece	9,700	19	4	415	65	113.0	458	497	195	185	273	300	46	45
Ireland	3,200	2	0	50	0	186.0	270	270	20	20	20	20	0	0
Italy	56,970	397	28	5,300	1,000	204.7	4,854	5,288	2,148	2,392	4,259	4,714	787	822
Netherlands	14,420	33	3	1,992	158	377.1	2,256	2,488	692	719	1,737	1,885	147	158e
United Kingdom	55,950	95	3	3,766	196	295.7	7,070	7,502	1,655	1,820	3,209	3,507	173	190
EEC	**270,537**	**923**	**106**	**28,182**	**6,407**	**294.8**	**33,613**	**36,169**	**13,524**	**14,240**	**26,189**	**28,359**	**5,540**	**5,949**
Finland	4,884	46	50	8,140	9,050	396.9	1,182	1,401	5,623	6,519	6,368	7,318	7,163	8,031
Norway	4,114	23	27	1,815	2,195	321.9	527	561	1,243	1,411	1,388	1,562	1,640	1,864
Sweden	8,330	56	56	7,670	9,957	489.5	1,858	1,899	5,699	6,206	6,350	6,869	8,668	9,240
Scandinavia	**17,328**	**125**	**133**	**17,626**	**21,202**	**423.6**	**3,567**	**3,861**	**12,565**	**14,136**	**14,106**	**15,749**	**17,471**	**19,138**
Austria	7,552	34	16	2,196	1,433	264.6	831	938	1,170	1,223	1,789	1,922	1,169	1,229
Iceland	235	0	0	0	0	206.4	24	22	0	0	0	0	0	0
Malta	350	0	0	0	0	189.0	30	30	0	0	0	0	0	0
Portugal	9,905	95	8	720	1,105	109.7	471	493	423	532	595	653	1,042	1,155
Spain	38,000	186	29	3,290	1,635	173.2	2,779	2,985	1,383	1,429	2,754	2,950	1,412	1,435
Switzerland	6,482	29	6	1,090	325	383.0	1,053	1,126	540	545	918	986	284	302
Other W. Europe	**62,524**	**344**	**59**	**7,298**	**4,498**	**197.3**	**5,188**	**5,594**	**3,516**	**3,729**	**6,056**	**6,511**	**3,907**	**4,121**
Total W. Europe	**350,389**	**1,392**	**298**	**53,065**	**32,107**	**283.8**	**42,368**	**45,624**	**29,605**	**32,105**	**44,351**	**48,619**	**26,918**	**29,206**
Albania	2,750	4	4	15	15	15.2	19	19	10	10	10	10	10	10
Bulgaria	8,950	20	–	540	280	115.8	406	470	352	365	359	385	203	220
Czechoslovakia	15,481	49	22	1,370	1,223	169.8	1,182	1,181	984	983	1,258	1,263	977	1,052
German Dem. Rep.	16,701	21	19	1,500e	750e	179.2	1,352	1,357	796	815	1,244	1,296	674	687
Hungary	10,600	10	6	550e	190e	139.4	649	670	311	301	478	506	103	106
Poland	37,000	50	20	1,365	1,030	75.6	1,240	1,268	986	1,042	1,221	1,238	871	878
Romania	22,000	20	12	900	970	70.7	705	705	945	0	810	810e	845	845e
USSR	274,000	84	57	10,500e	9,500e	75.0	9,227	9,449	7,238	7,452	9,558	9,825	7,913	8,152
Yugoslavia	23,052	30	21	1,500	825	112.5	1,169	1,175	884	948	1,229	1,331	787	841
E. Europe	**410,534**	**288**	**161**	**18,240**	**14,743**	**87.5**	**16,009**	**16,294**	**12,516**	**12,871**	**16,167**	**16,684**	**12,363**	**12,773**
Total Europe	**760,923**	**1,680**	**459**	**71,305**	**46,850**	**177.9**	**58,377**	**61,918**	**42,121**	**44,976**	**60,518**	**65,293**	**39,281**	**41,978**
NORTH AMERICA														
Canada	25,100	107	34[1]	15,552	23,646	441.6	4,681	5,029	12,589	13,664	13,351	14,222	19,231	20,173
United States	235,000	581	195	65,998	51,837	632.8	63,348	68,636	48,069	51,207	58,983	62,307	47,662	50,394
North America	**260,100**	**688**	**229**	**81,550**	**75,483**	**614.4**	**68,029**	**73,665**	**60,658**	**64,871**	**72,334**	**76,529**	**66,893**	**70,567**
ASIA														
Afghanistan	16,000	0	0	0	0	0.1	1	1e	0	0	0	0	0	0
Bangladesh	92,000	7	8	170e	150e	2.0	85e	85e	90e	90e	90e	90e	80e	80e
Bahrain	400	0	0	0	0	16.5	3	3e	0	0	0	0	0	0
Bhutan	1,400	0	0	0	0	1.6	1	1e	0	0	0	0	0	0
Brunei	300	0	0	0	0	14.7	2	2e	0	0	0	0	0	0
Burma	34,000	4	2	–	–	2.6	40e	40e	15e	15e	10e	10e	15e	15e
China, People's Rep.	1,036,040	1,600e	–	7,810	6,650	17.6	6,347	7,328	4,725	5,352	6,613	7,580	4,725	5,352
Cyprus	850	0	0	–	0	169.6	45	50e	0	0	0	0	0	0
Hong Kong	5,200	3	0	40e	0	286.2	665e	675e	5e	5e	35e	35e	0	0
India	683,000	222	–	2,165	1,450	4.8	1,517	1,502	1,050e	1,050e	1,337	1,367	1,050e	1,050e
Indonesia	150,000	35	16	877	300e	9.5	626	649e	386	345e	377	405e	167	200e
Iran	40,000	17	2	320e	250e	13.8	300e	250e	80e	60e	100e	75e	50e	40e
Iraq	13,000	2	2	144	90	11.9	70e	70e	40e	40e	30e	30e	30e	30e
Israel	4,400	5	0	155	0	179.4	343	358	68	69	139	152	0	0
Japan	120,235	593	65	23,495	12,519	372.6	18,389	19,200	10,986	11,252	18,442	18,345	8,860	9,127
Jordan	3,000	1	0	8	0	44.1	45	53	0	0	4	7	0	0
Kampuchea	9,000	0	0	0	0	1.2	5	5e	0	0	0	0	0	0
Korea, People's Rep.	20,000	6	2	100e	80e	9.9	90e	90e	50e	50e	80e	80e	50e	50e
Korea, Rep. of	40,577	170e	5	2,232	307	119.2	1,935	2,193	754	849	1,982	2,207	242	258
Kuwait	1,400	1	0	25	0	141.8	85e	90e	5e	10e	15e	20e	0	0
Laos	4,000	0	0	0	0	1.1	2	2e	0	0	0	0	0	0
Lebanon	3,300	3	0	20e	0	43.4	85e	65e	5e	5e	5e	5e	0	0
Macao	300	0	0	0	0	73.5	10	10e	0	0	0	0	0	0
Malaysia	11,427	13	–	100e	60e	70.6	362e	374e	45e	52e	65e	70e	40e	45e
Mongolia	1,750	1	1	10e	0	25.2	20e	20e	5e	5e	5e	5e	5e	5e
Nepal	16,400	1	–	3	–	1.6	10e	12e	0	0	0	2	0	0
Oman	1,000	0	0	0	0	11.0	5	5e	0	0	0	0	0	0
Pakistan	87,524	20e	18e	145e	115	4.4	259	260e	126	133e	133	136e	110	115e
Philippines	55,000	23	9	305	303	16.6	449	415	214	193	287	286	155	147
Qatar	300	0	0	0	0	14.7	2	2e	0	0	0	0	0	0
Saudi Arabia	9,500	0	0	0	0	23.2	100	100e	0	0	0	0	0	0
Singapore	2,500	2	0	20e	0	273.4	310e	310e	5e	5e	10e	10e	0	0
Sri Lanka	15,000	2	2	40	25	10.3	70e	70e	28e	28e	25e	25e	21e	21e
Syria	9,000	3	0	35e	0	20.6	84e	84e	10e	10e	10e	10e	0	0
Taiwan	19,013	140	3[1]	2,300	600e	229.7	1,704	1,981	686e	713e	1,720	1,929	550e	575e
Thailand	50,000	33	5	450	110	23.9	515	542e	180	170e	398	380e	40	50
Turkey	48,000	36	17	637e	547e	33.8	580	736e	665e	650e	570	742e	545e	570e
United Arab Emirates	1,000	0	0	0	0	13.2	6	6	0	0	0	0	0	0
Vietnam	60,000	30e	30e	120	90	2.2	90e	60e	45e	50e	40e	50e	15e	20e
Yemen Arab Rep.	5,500	0	0	0	0	0.8	2	2e	0	0	0	0	0	0
Yemen Dem. Rep.	2,000	0	0	0	0	2.2	2	2e	0	0	0	0	0	0
Asia	**2,673,118**	**2,982**	**187**	**41,826**	**23,696**	**31.1**	**36,221**	**37,703**	**20,208**	**21,201**	**32,482**	**34,993**	**16,750**	**17,750**

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INDUSTRY AT A GLANCE

	Population (1,000)	Number of mills		CAPACITY (1,000 m tons)		Per capita (lb)	CONSUMPTION (1,000 tons)				PRODUCTION (1,000 m tons)			
		P&B	Pulp	P&B	Pulp		P&B		Pulp		P&B		Pulp	
							1983	1984	1983	1984	1983	1984	1983	1984
AUSTRALASIA														
Australia	15,543	16	18	1,669	1,155	313.1	1,970	2,207	808	980	1,461	1,569	618	716
Fiji	700	0	0	0	0	31.5	10	10e	0	0	0	0	0	0
New Zealand	3,230	6	9	818	1,475	291.1	419	471	611	683	668	752	1,073	1,158
Papua New Guinea	3,300	0	0	0	0	4.0	6	6e	0	0	0	0	0	0
Samoa	200	0	0	0	0	11.0	1	1e	0	0	0	0	0	0
Australasia	**22,973**	**22**	**27**	**2,487**	**2,630**	**294.4**	**2,406**	**2,695**	**1,439**	**1,663**	**2,129**	**2,321**	**1,691**	**1,874**
LATIN AMERICA														
Argentina	30,000	86	20	1,200	815	70.6	946	960	660	647	887	943	618	664
Bahamas	226	0	0	0	0	97.6	10	10	0	0	0	0	0	0
Barbados	280	0	0	0	0	56.1	7	7	0	0	0	0	0	0
Belize	150	0	0	0	0	14.7	2	1	0	0	0	0	0	0
Bolivia	5,600	9	5	62e	32e	30.0	90	90e	40	40e	59	59e	26	26e
Brazil	134,000	164	48	4,140	3,990	54.1	3,266	3,296	2,082	2,441	3,418	3,765	3,090	3,387
Chile	12,000	18	7	450	900e	49.4	266	269e	274	349e	324	339e	796	838
Colombia	28,000	26	6	530	250	35.5	461	451e	235	235e	365	365e	189	189
Costa Rica	2,800	2	1	18	25	11.9	13	14	10	12	13	14	10	12
Cuba	10,000	9	3	150e	60e	51.2	232	232e	80	80e	73	73e	32	38e
Dominican Rep.	5,551	2	0	46	0	25.8	66	66e	4	4e	9	9e	0	0
Ecuador	8,500	6	2	62e	14e	24.4	94	94e	26	26e	44	44e	4	4e
El Salvador	5,500	3	0	50	0	10.4	26	26	0	0	26	26	0	0
Guatemala	7,500	4	1	50	200	24.7	95	84e	10	5	40	34	0	0
Guyana	900	0	0	0	0	17.2	7	7e	0	0	0	0	0	0
Haiti	5,800	0	0	0	0	2.3	6	6e	0	0	0	0	0	0
Honduras	4,000	0	0	0	0	38.6	65	70	0	0	0	0	0	0
Jamaica	2,228	1	0	5	0	14.9	16	15	0	0	3	4	0	0
Mexico	77,500	65	20	3,096	1,066	66.2	2,179	2,265	922	1,013	2,062	2,240	759	861
Neth. Antilles	247	0	0	0	0	26.8	3	3e	0	0	0	0	0	0
Nicaragua	2,000	0	0	0	0	22.1	20	20	0	0	0	0	0	0
Panama	2,100	3	0	26	0	84.0	80	80	0	0	23	25	0	0
Paraguay	3,117	3	–	23e	25e	18.4	28	29e	15	15e	13	13e	15	15e
Peru	19,000	15	4	427	311	21.2	175	183e	60	60e	130	136e	58	54e
Surinam	355	0	0	0	0	93.2	15	15e	0	0	0	0	0	0
Trinidad/Tobago	1,149	0	0	0	0	23.0	10	12	0	0	0	0	0	0
Uruguay	2,900	12	3	60	30	44.1	47	58	33	37	47	54	28	30
Venezuela	16,800	14	3	753	160	100.0	700	783	473	619	467	557	236	264
Latin America	**388,061**	**442**	**123**	**11,138**	**7,866**	**51.8**	**8,920**	**9,121**	**4,852**	**5,606**	**8,003**	**8,702**	**5,871**	**6,302**
AFRICA														
Algeria	20,000	6	3	35	25	18.3	166	166e	90	90e	66	66e	30	30e
Angola	7,200	2	1	30	45	6.6	28	28e	25	25e	15	15e	36	36e
Benin	3,700	0	0	0	0	1.8	3e	3e	0	0	0	0	0	0
Botswana	900	0	0	0	0	2.5	1e	1e	0	0	0	0	0	0
Burkina Faso	7,000	0	0	0	0	0.2	1	1	0	0	0	0	0	0
Burundi	4,600	0	0	0	0	1.9	4	4e	0	0	0	0	0	0
Cameroon	8,600	0	0	0	0	7.7	30	30e	0	0	0	0	0	0
Central African Rep	2,300	0	0	0	0	1.0	1	1e	0	0	0	0	0	0
Chad	4,600	0	0	0	0	0.5	1	1e	0	0	0	0	0	0
Congo	1,600	0	0	0	0	1.4	1	1e	0	0	0	0	0	0
Egypt	49,000	16	3	180	80	21.3	292	473	82	77	138	149	47	42
Ethiopia	33,000	2	0	10e	0	1.1	10e	10e	10e	10e	6e	6e	0	0
Gabon	600	0	0	0	0	7.3	2	2e	0	0	0	0	0	0
Gambia	600	0	0	0	0	7.3	2	2e	0	0	0	0	0	0
Ghana	12,000	0	0	0	0	0.6	3	3e	0	0	0	0	0	0
Guinea	5,400	0	0	0	0	1.6	4	4e	0	0	0	0	0	0
Ivory Coast	8,200	0	0	0	0	9.4	35	35e	0	0	0	0	0	0
Kenya	17,000	5	1	80	60	14.8	61	114	58	57	63	116	53	53
Lesotho	1,400	0	0	0	0	1.6	1	1e	0	0	0	0	0	0
Liberia	1,900	0	0	0	0	1.2	1	1e	0	0	0	0	0	0
Libya	3,000	20	10	0	0	15.4	21e	21e	6e	6e	6e	6e	0	0
Madagascar	10,000	1	2	30	11	2.9	13e	13e	11	11	10	10	7	7
Malawi	6,100	0	0	0	0	4.3	12	12e	0	0	0	0	0	0
Mali	7,000	0	0	0	0	0.3	1	1e	0	0	0	0	0	0
Mauritania	1,700	0	0	0	0	5.2	4	4e	0	0	0	0	0	0
Mauritius	1,000	0	0	0	0	15.4	7	7e	0	0	0	0	0	0
Morocco	22,300	8	1	130	100	10.7	182	189	55	43	108	112	86	83
Mozambique	10,500	2	0	10e	0	4.8	23e	23e	3e	3e	3e	3e	0	0
Niger	5,500	0	0	0	0	0.4	1	1e	0	0	0	0	0	0
Nigeria	90,000	3	3	56	25	5.0	210	206e	5	44e	0	56	0	25
Rwanda	5,100	0	0	0	0	0.9	2	2e	0	0	0	0	0	0
Senegal	5,800	0	0	0	0	6.5	17	17e	0	0	0	0	0	0
Sierra Leone	3,800	0	0	0	0	1.2	2	2e	0	0	0	0	0	0
Somalia	3,800	0	0	0	0	1.2	2	2e	0	0	0	0	0	0
South Africa	24,000	17	10	1,460	1,190	129.3	1,282	1,407	985e	985e	1,286	1,388	1,180e	1,180e
Sudan	21,500	1	0	6	0	3.8	14	37	0	0	3	3	0	0
Swaziland	900	0	1	0	180	25.5	1	6	0	0	0	0	175	175
Tanzania	17,750	2	1	34	50	3.5	29e	29e	3e	3e	3e	3e	0	0
Togo	2,700	0	0	0	0	4.9	6	6e	0	0	0	0	0	0
Tunisia	6,500	5	1	35e	25e	26.5	70e	70e	40e	40e	30e	30e	20e	20e
Uganda	13,500	1	0	5	0	1.3	8e	8e	3e	3e	3e	3e	0	0
Zaire	29,000	1	0	4	0	0.8	11e	11e	3e	3e	3	3	0	0
Zambia	6,250	1	2	15	15e	11.3	32e	32e	13e	13e	12e	12e	10e	10e
Zimbabwe	8,400	3	2	83	20	19.7	74	75	46	49	60	67	26	29
Africa	**495,100**	**95**	**41**	**2,263**	**1,819**	**13.7**	**2,694**	**3,075**	**1,436**	**1,464**	**1,866**	**2,083**	**1,654**	**1,677**
WORLD TOTAL	**4,690,213**	**5,910**	**1,065**	**210,607**	**166,906**	**90.2**	**175,647**	**166,177**	**130,816**	**139,783**	**177,282**	**169,911**	**132,140**	**140,166**

TOP 27 PRODUCING NATIONS *(Continued)*

Norway

Population: 4,114,000. Per capita consumption of paper and board: 146 kg/322 lb. Paper and board mills: 23. Pulp mills: 27 (sulfate: 2; sulfite: 4; semichemical: 2; mechanical: 19).

Paper/board capacity: 1,815,000 tons
Operating rate 1984: 88%

Pulp capacity: 2,195,000 tons
Operating rate 1984: 85%

(000 metric tons)

	Production		**Imports**		**Exports**	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	1,232	1,423	120	126	959	1,118
Board	134	139	96	83	96	92
Total	**1,366**	**1,562**	**216**	**209**	**1,057**	**1,210**
Chemical woodpulp	580	655	127	111	240	259
Other pulps	1,060	1,209	11	6	295	311
Total	**1,640**	**1,864**	**138**	**117**	**535**	**570**

Poland

Population: 37,000,000. Per capita consumption of paper and board: 34 kg/75 lb. Paper and board mills: 50. Pulp mills: 20 (sulfate: 6; sulfite: 2; semichemical: 2; mechanical: 8; nonwood: 2).

Paper/board capacity: 1,365,000 tons

Pulp capacity: 1,030,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	813	781	73	87	29	39
Board	408	457	27	38	52	56
Total	**1,221**	**1,238**	**100**	**125**	**81**	**95**
Chemical woodpulp	678	688	112	148	32	29
Other pulps	193	190	.45	45	—	—
Total	**871**	**878**	**157**	**193**	**32**	**29**

Portugal

Population: 9,905,000. Per capita consumption of paper and board: 50 kg/110 lb. Paper and board mills: 95. Pulp mills: 8 (sulfate: 5; sulfite: 2; soda: 1).

Paper/board capacity: 720,000 tons
Operating rate 1983: 91%

Pulp capacity: 1,105,000 tons
Operating rate 1983: 117%

(000 metric tons)

	Production		**Imports**		**Exports**	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	408	450	59	58	47	66
Other paper and board	187	203	14	3	150	155
Total	**595**	**653**	**73**	**61**	**197**	**221**
Chemical woodpulp	1,010	1,107	20	26	641	651
Other pulps	32	48	2	2	—	—
Total	**1,042**	**1,155**	**22**	**28**	**641**	**651**

Romania

Population: 22,000,000. Per capita consumption of paper and board: 32 kg/71 lb. Paper and board mills: 20. Pulp mills: 12 (sulfate: 7; sulfite: 3; semichemical: 1; mechanical: 1).

Paper/board capacity: 900,000e tons

Pulp capacity: 970,000e tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1983e	**1984e**	**1983e**	**1984e**	**1983e**	**1984e**
Paper	270	270	—	—	—	—
Other paper and board	540	540	—	—	—	—
Total	**810**	**810**	**45**	**45**	**150**	**150**
Chemical woodpulp	675	670	—	—	—	—
Other pulps	170	170	—	—	—	—
Total	**845**	**845**	**130**	**130**	**30**	**30**

South Africa

Population: 24,000,000. Per capita consumption of paper and board: 59 kg/129 lb. Paper and board mills: 17. Pulp mills: 10.

Paper/board capacity: 1,460,000 tons

Pulp capacity: 1,190,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	690	766	169	197	171	195
Board	565	623	71	83	36	68
Total	**1,255**	**1,398**	**239**	**279**	**202**	**270**
Chemical woodpulp	460	n.a.	220	n.a.	30	n.a.
Other pulps	705	n.a.	—	n.a.	363	n.a.
Total	**1,165**	**1,165**	**220**	**220**	**400**	**400**

Spain

Population: 38,000,000. Per capita consumption of paper and board: 79 kg/173 lb. Paper and board mills: 186. Pulp mills: 29 (sulfate: 14; semichemical: 1; mechanical: 9; nonwood: 6).

Paper/board capacity: 3,290,000 tons
Operating rate 1984: 90%

Pulp capacity: 1,635,000 tons
Operating rate 1984: 88%

(000 metric tons)

	Production		**Imports**		**Exports**	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	1,459	1,578	246	265	260	300
Other paper and board	1,295	1,372	167	182	128	113
Total	**2,754**	**2,950**	**413**	**448**	**388**	**413**
Chemical woodpulp	1,077	1,105	258	287	264	278
Other pulps	335	330	3	8	26	23
Total	**1,412**	**1,435**	**261**	**295**	**290**	**301**

Sweden

Population: 8,330,000. Per capita consumption of paper and board: 222 kg/489 lb. Paper and board mills: 56. Pulp mills: 56 (sulfate: 25; sulfite: 8; semichemical: 2; mechanical: 21).

Paper/board capacity: 7,670,000 tons
Operating rate 1984: 93%

Pulp capacity: 9,957,000 tons
Operating rate 1984: 95%

(000 metric tons)

	Production		**Imports**		**Exports**	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	3,793	4,160	147	152	2,728	3,083
Board	2,557	2,709	67	68	1,978	2,107
Total	**6,350**	**6,869**	**214**	**220**	**4,706**	**5,190**
Chemical woodpulp	6,628	6,976	85	102	2,644	2,742
Other pulps	2,040	2,264	25	26	435	420
Total	**8,668**	**9,240**	**110**	**128**	**3,079**	**3,162**

Taiwan

Population: 19,013,000. Per capita consumption of paper and board: 104 kg/229 lb. Paper and board mills: 149. Market pulp mills: 3* (sulfate: 1; nonwood: 2).

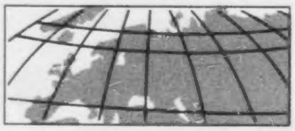
Paper/board capacity: 2,300,000 tons
Operating rate 1984: 94%

Pulp capacity: 600,000e tons
Operating rate 1984: 81%

(000 metric tons)

	Production		**Imports**		**Exports**	
	1983	**1984**	**1983**	**1984**	**1983**	**1984**
Paper	537	492	94	103	27	18
Board	1,183	1,437	13	46	96	78
Total	**1,720**	**1,929**	**107**	**149**	**123**	**97**
Chemical woodpulp	216	225	173	152	58	31
Other pulps	84	100	7	17	6	—
Total	**550e**	**575e**	**180**	**169**	**64**	**31**

*Market pulp only.



EUROPE

FOR MAJOR PRODUCERS in western Europe, 1984 was a good year—for many it was a record-breaker. There were several new national all-time highs for paper and board output and profit peaks for many companies. But demand began to fall away toward the end of the year, and the first half of 1985 saw generally shakier prices and some decline in shipments of major grades. The widespread economic recovery in 1984 fueled paper and board consumption (which was up 7.7% from 1983 at 50.3 million short tons), resulting in many mills running full-out, and successful price rises through the year. For some grades, particularly printing/writing grades, order backlogs built up.

With Fed. Rep. Germany alone increasing its output by 975,536 tons from 1983, total EEC production was up nearly 9% at 29.1 million tons. All paper-producing EEC members increased output; even Italy recovered from a sequence of two bad years. Pulp output was 6.56 million tons, a rise of 7.4%.

Greater demand within the EEC was the main reason for the increased output, but many countries also benefited from the growing export markets, particularly high U.S. demand. Helped by a strong dollar later in the year, the U.S. was a new sales area for many European printing/writing paper mills.

Both the U.S. and EEC markets provided Nordic producers with one of their best years, many of them making record profits. They also took considerable European market share away from North American pulp and paper exporters, partly due to favorable exchange rates.

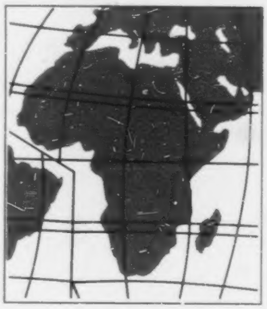
The year-end totals tell the story: exports from the three Nordic nations were just over 13.7 million tons, up 12.3% from 1983. Paperboard output was 17.3 million tons, a rise of 11.6%. Sweden alone made 551,150 tons more paper than in 1983, and its pulp exports jumped over 88,185 tons to 3.5 million.

With mills running flat-out for most of the year, Finland's paper sales organization, Finnpap (Finnish Paper Mills' Assn.) had a record year in both value and tonnage shipped. The shipments to North America alone jumped 65% to 458,557 tons, but 75% of the 5.2 million tons of Finnish paper shipped went to Europe.

Western Europe's biggest papermaking country, Fed. Rep. Germany, also had a good year, with most sectors running at capacity. Output in 1984 set a new record of 10.1 million tons, up 11% from 1983. Several trends in the German market during 1984 were common throughout Europe. More pulp came from Scandinavia (up 14%), while North American deliveries declined; paper imports rose 12%, with the EFTA countries providing 59%; domestic wastepaper consumption was up 14% at nearly 4.4 million tons and continued to be German mills' biggest raw material source.

Both Spain and Portugal had higher pulp exports during 1984, mostly to the EEC. Together the two shipped 1.05 million tons of mainly bleached eucalyptus pulp. They are both joining the EEC, effective Jan. 1, 1986, bringing membership to 12 nations, which will have a total paper/board production of around 33 million tpy.

Paper production in eastern Europe also increased in 1984, though more modestly, with total output up 3%, at 18.4 million tons. Pulp output was 14.1 million tons, up 3.3%. The dominant producer, the U.S.S.R., made 10.8 million tons of paper and board. It is intending to make much greater use of its extensive hardwood forests in the European part of the country. Of the other countries making more than 1.1 million tpy, Czechoslovakia, Dem. Rep. Germany, and Poland increased paper and board output only slightly above 1983. But Yugoslavia's production rose by 8.3%, to 1.47 million tons, despite some raw material shortages. Among other major increases was the jump in Czechoslovakia's pulp exports—largely to western Europe—by over 55,115 tons to 167,550 as production at its new market pulp mills gets underway.



AFRICA

PAPER AND BOARD output grew by 15% in 1984 to close to 2.3 million short tons. Most of this growth could be explained by a 157,600-ton rise in South Africa's production. However, long-awaited projects in other African nations are now beginning to start up.

Kenya is reported to be approaching self-sufficiency in paper and board products, and its output grew 87%, to 130,000 tons. Nigeria has started one of its three major integrated paper mill complexes, Nigerian Paper Mill Ltd.'s 110,200-tpy linerboard, corrugating medium, and kraft paper mill at Jebba.

The rise in paper and board production is the first for several years but is the herald of a much livelier African industry, dominated by the massive expansions that were completed in South Africa between late 1984 and early 1985. These not only will affect paper and board output but will make South Africa a major market pulp producer. After another static year in 1984, pulp production should rise significantly in 1985.

Both Mondi Paper Co. Ltd.'s Richards Bay and Sappi Ltd.'s Ngodwana mills are set to enter the market pulp and kraft liner markets, jointly supplying 385,800 tpy of market pulp and 165,350 tpy of packaging board when they are fully onstream in 1987. Startup market pulp tonnage from Mondi had already reached the European market by mid-1985.

During 1985 several other projects are due to come onstream, although foreign currency restrictions in many African countries are a serious drawback to buying raw materials and foreign assistance for startup and commissioning. Scarce resources tend to be allocated to projects like newsprint and packaging papers, which will, in time, save considerable amounts of foreign exchange for the countries concerned.

Southern Paper Mill's 33,000-tpy Mufindi kraft paper mill in Tanzania has commenced trials after a considerable delay, making printing/writing and kraft papers. Two Egyptian printing and writing paper projects at National Paper Co. and Ratka are scheduled for completion during the year. There is also considerable confidence that Nigerian Newsprint Mills will start production during the year. In the longer term, Zimbabwe is conducting a feasibility study into an integrated mill, based on local hardwood plantations.

Many of the long-delayed African projects finally seem to be approaching completion. Whether they will reach startup and commissioning will depend on the priority given by governments to the industry during the allocation of foreign exchange reserves.

TOP 27 PRODUCING NATIONS *(Continued)*

United Kingdom

Population: 55,950,000. Per capita consumption of paper and board: 134 kg/295 lb. Paper and board mills: 95. Pulp mills: 3 (semichemical: 2; mechanical: 1).

Paper/board capacity: 3,766,000 tons **Pulp capacity:** 196,000 tons
Operating rate 1984: 95% **Operating rate 1984:** 97%

(000 metric tons)

	Production		Imports		Exports	
	1983	1984	1983	1984	1983	1984
Paper	1,464	1,665	2,728	2,943	179	232
Other paper and board	1,745	1,842	1,557	1,585	245	301
Total	**3,209**	**3,507**	**4,285**	**4,528**	**424**	**533**
Chemical woodpulp	n.a.	n.a.	1,339	1,383	1	3
Other pulps	n.a.	n.a.	144	253	—	3
Total	**173**	**190**	**1,483**	**1,636**	**1**	**6**

United States

Population: 235,000,000. Per capita consumption of paper and board: 287 kg/633 lb. Paper and board mills: (1982) 581. Pulp mills: (1982) 195 (sulfate: 120; sulfite: 20; semichemical: 41; mechanical: 47).

Paper/board capacity: 65,998,000 tons **Pulp capacity:** 51,837,000 tons
Operating rate 1984: 94% **Operating rate 1984:** 91%

(000 metric tons)

	Production		Imports		Exports	
	1983	1984	1983	1984	1983	1984
Paper	29,793	31,228	7,787	9,528	721	760
Board	29,190	31,079	152	220	2,853	2,659
Total	**58,983**	**62,307**	**7,939**	**9,748**	**3,574**	**3,419**
Chemical woodpulp	41,920	44,280	3,372	3,693	2,713	2,716
Other pulps	5,742	6,114	341	380	593	544
Total	**47,662**	**50,394**	**3,713**	**4,073**	**3,306**	**3,260**

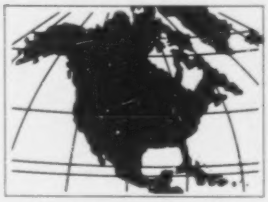
U.S.S.R.

Population: 274,000,000. Per capita consumption of paper and board: 34 kg/75 lb. Paper and board mills: 84. Pulp mills: 57.

Paper/board capacity: 10,500,000e tons **Pulp capacity:** 9,500,000e tons

(000 metric tons)

	Production		Imports		Exports	
	1983	1984	1983	1984	1983	1984
Paper	5,669	5,860e	441	399	662	665
Board	3,889	3,965	270e	270e	380e	380e
Total	**9,558**	**9,825**	**711**	**669**	**1,042**	**1,045**
Chemical woodpulp	6,251	6,602e	275e	300e	955e	1,055e
Other pulps	1,662	1,550e	—	—	—	—
Total	**7,913**	**8,152**	**275e**	**300e**	**950e**	**1,000e**



NORTH AMERICA

THE ECONOMIC RECOVERY in the U.S., which began in mid-1983, continued through much of 1984 and brought the North American pulp and paper industry to all-time production records. 1984's 84.3 million short tons of paper and board was 5.8% higher than the previous record of 79.7 million tons in 1983. Healthy rises in profits were posted by many companies in both the U.S. and Canada.

In the U.S., strong gains by newsprint and printing/writing grades helped set the record for paper and board production at 68.7 million tons, 5.6% above the previous record year, 1983. The industry's operating rate was up to 94.4% from 91.4% the previous year. Total pulp output increased by 5.7% to 55.5 million tons, while market pulp rose 6.4% to a new record at 6.9 million tons.

Demand in the coated paper market was exceptionally strong, with domestic supply being augmented by imports equivalent to 10% of U.S. production. Newsprint imports rose 14% and there were some indications that Nordic producers were planning to become permanent suppliers to the U.S. market.

The Canadian industry, operating at 90% of capacity, produced a record-high 23.3 million tons of pulp and paper, 2.5% above the previous record of 21.7 million tons in 1980. Total paper and board production was up 6.5% to 15.6 million tons, and exports were up 7%. Total newsprint production reached a record 9.9 million tons while exports were 8.8 millions tons, a 6.6% rise, although overseas exports fell by 5%. Printing/writing production was up 13%, and exports up 17%.

Total pulp and paper production in the second half of the year was 5% higher than in the first half, which largely reflects the ten-week work stoppage at British Columbian mills. Exports of woodpulp actually declined by 1% to 7.4 million tons. This was thought to be due to the modest 1% growth in world market pulp demand last year, the British Columbian labor problems, and the high value of the U.S. dollar.

Canada continued its fight against EEC attempts to limit non-EFTA duty-free newsprint to 500,000 metric tpy (551,000 short tpy). In early 1985 the quota was raised to 650,000 metric tons (716,500 short tons). Non-EFTA shipments of newsprint to the EEC were 589,730 tons in 1984, of which 474,000 tons came from Canada.

With the general slowing of business activity in first-quarter 1985, this year's outlook is less optimistic than last year's. Total paper and paperboard demand should show a modest gain over 1984, but there is growing concern about the large U.S. trade and budget deficits.

ITT Rayonier's president and CEO talks about specialty pulp markets

R.M. Gross of ITT Rayonier discusses restructuring of the dissolving pulp industry and worldwide trends in fluff and paper-grade pulp markets

By WILLARD MIES, Executive News Editor

■ In a recent interview with Pulp & Paper, ITT Rayonier Inc.'s president and CEO, Ronald M. Gross, talked about his company's pulp production capabilities and changing trends in the dissolving and fluff pulp markets. Dissolving pulp demand in recent years has been declining, resulting in considerable overcapacity worldwide. Fluff pulp consumption, however, has continued to grow faster than the demand for market pulp used in paper products.

ITT Rayonier produces all three major types of pulp at its four mills located at Fernandina Beach, Fla.; Jesup, Ga.; Hoquiam, Wash.; and Port Angeles, Wash. Last year the company racked up sales of $683 million from sales of market pulp, silvichemicals and wood products. Profits, however, have been under pressure from the strong dollar and overcapacity in market pulp and lumber.

Gross joined ITT Rayonier as president and chief operating officer in 1978. He previously served as president and chief executive officer of Canadian Cellulose Co. Ltd. (now known as Westar Timber Ltd.) in British Columbia. His first positions in the industry between 1960-68 were held with Champion International Corp.

P&P: *What is ITT Rayonier Inc.'s overall pulp production vs capacity? And can you divide capacity between dissolving, fluff, and paper-grade pulps?*

Gross: Total production last year was 755,000 metric tons vs capacity of 900,000 metric tons. It is difficult to divide capacity because, except for Grays Harbor Paper Co., our mills are flexible and able to produce a wide range of dissolving, fluff, and paper pulps. The mills' flexibility gives an advantage in shifting production to market needs.

Gross

P&P: *Hasn't Rayonier concentrated on the more profitable higher-alpha dissolving pulp grades? Aren't you also shifting more production into fluff and paper pulp grades?*

Gross: Rayonier is one of the leading producers of higher purity and more technically demanding dissolving grades. We intend to maintain this technical leadership in the future because the chemical cellulose market will continue to be very important to us.

Our markets are changing, however, and we're changing as well. Fluff pulp has been an important market for Rayonier, and it will become even more important in the future. Within the past two years we have added fluff capacity at both our Jesup and Port Angeles mills.

P&P: *What is the size and recent growth rate for the overall world dissolving pulp market?*

Gross: Traditional sources for market dissolving pulp are the Scandinavian countries, the U.S., and Canada. In the last few years South Africa has become a significant factor. Overall demand for market dissolving pulp is 1.5 million metric tpy. On a trend basis, consumption has been declining.

P&P: *Which segments of the market have shown the strongest growth and which have been declining?*

Gross: No segments of chemical cellulose markets have shown growth over the past few years except acetate for cigaret tow manufacture. We anticipate modest growth to continue in this area.

P&P: *What will be the future growth rate of the overall market?*

Gross: The production of products from wood cellulose is on the decline in North America, Europe, and Japan. Increases in rayon production in less developed countries and in the East Bloc will partially offset the decline in the primary market areas. On the other hand, many of the new rayon plants will use locally produced pulps and not traditional market sources for supply.

Overall, decline in dissolving pulp consumption will average 1% to 2%/year.

***P&P:** Hasn't the flat-to-declining trend resulted in overcapacity in dissolving pulp? How has this affected dissolving pulp prices, particularly with the recent strength of the dollar?*

Gross: Without question, significant overcapacity exists within the industry. This factor, coupled with the strong dollar, has caused prices for dissolving pulp to fall, although the drop has been moderate in the more specialized, higher-purity grades. On a trend basis, we do not see a better balance between supply and demand for several years, except for periodic, cyclical improvement.

***P&P:** Do you see world dissolving pulp supply and demand coming into better balance?*

Gross: An upturn in the world economy could mean improved operating rates on a cyclical basis. But this would be temporary and not change the trend or fundamental balance.

***P&P:** Will the North American dissolving pulp industry face further restructuring because of excess world capacity and the strong competitive advantage of some foreign producers? Which types of dissolving pulp mills are most likely to survive?*

Gross: Over the intermediate term, we could see some restructuring of the North American dissolving pulp industry. Over the next five to ten years, some North American, European, and Japanese mills will probably close. The mills that survive will be those that can produce the product at the lowest cost or those that shift to another product base.

***P&P:** Hasn't the western European dissolving pulp industry been undergoing restrcturing with something like 400,000 tpy capacity shut down in recent years?*

Gross: Most of the capacity reduction in our industry has been concentrated in Europe over the past ten to 15 years because, in a declining market, they were the high-cost producers until recently when the exchange rate shift significantly improved the European industry's cost position.

***P&P:** Isn't most of the growth in dissolving pulp capacity taking place in nontraditional producing regions and the East Bloc nations? Do mills in countries like South Africa have a significant cost advantage that will enable them to dominate segments of the dissolving pulp markets?*

Gross: The answer to the first question is yes. South Africa has an advantage because of the strong dollar, as well as cheaper wood, lower labor rates, and, very importantly, virtually no environmental capital and operating costs. The cost advantages of the South African mills will permit them to increase their market share more easily than other producers.

***P&P:** What is the estimated growth rate and size of the U.S. fluff pulp market? Has this growth been slowing because of the high level of market penetration by disposable baby diapers?*

Gross: World consumption of fluff is 2.2 million metric tpy. The market portion is 1.5 million metric tons, approximately. The U.S. represents a significant portion of world consumption. The growth rate has been slowing, largely because of the bigger base and already high penetration in the North American and European diaper markets.

***P&P:** Do you expect use of superabsorbents in baby diapers to have much impact on fluff pulp demand? Will incontinent products (such as underpads and adult diapers) be a significant future growth area for fluff pulps?*

Gross: The future is unclear for superabsorbents. More testing is needed before they can be widely used. Some testing is going on with superabsorbents in diapers, using less fluff pulp to provide equal absorbency. Supers could have an effect, but we don't think it will be a serious one.

Adult diapers will be a significant factor and will boost fluff pulp consumption over the next ten years. At Rayonier, we have just developed a new fluff pulp that we feel is highly suited for this market.

***P&P:** What is the outlook for U.S. fluff pulp exports? Any estimate of the size and growth rates for fluff pulp consumption in western Europe and Japan?*

Gross: The outlook for fluff pulp exports is very good. Current consumption in western Europe and Japan is close to 1 million metric tpy. The growth rate in Europe is estimated at 3% to 4%/year and in Japan at 6% to 7%.

***P&P:** Will southern pine continue to be the preferred fluff pulp grade for most applications in disposable products? Do you see special applications for sulfite fluff?*

Gross: Southern pine kraft fluffing pulps predominate the market, but I think we are going to see more and more sulfite fluffing pulps used. Rayonier is fortunate to be in a position to supply a wide range of fiber properties to the customer not only in kraft but in sulfite as well. This positions us well to meet changing needs.

***P&P:** Does CTMP have much of a future as a fluff grade?*

Gross: CTMP is used as a fluff pulp now but quantities are not great. It does, however, have growth potential. Most fluff pulp products like diapers will continue to be made with bleached chemical pulp.

***P&P:** Hasn't fluff accounted for much of the growth in U.S. chemical "paper-grade" market pulp shipments? How fast has the true paper pulp consumption been*

TABLE 1: **North American dissolving pulp production—long-run declining trend (000 metric tons).**

	U.S.	Canada	Total North America
1984	1,094	221	**1,315**
1983	1,143	215	**1,358**
1982	988	219	**1,207**
1981	1,224	275	**1,499**
1980	1,366	313	**1,679**
1979	1,360	367	**1,727**
1978	1,273	334	**1,607**
1977	1,327	269	**1,661**
1976	1,243	254	**1,497**
1975	1,118	228	**1,346**
1974	1,461	351	**1,812**
1973	1,356	251	**1,607**
1972	1,519	253	**1,772**
1971	1,524	288	**1,812**
1970	1,555	326	**1,881**
1965	1,347	306	**1,653**
1960	1,019	198	**1,217**
1955	880	324	**1,204**
1950	428	293	**721**

Sources: American Paper Institute; Canadian Pulp & Paper Assn.

growing in the U.S.?

Gross: Fluff pulp has been a source of much of the growth in chemical paper grade market pulp shipments, growing at more than 8% over the last seven years. True paper pulp consumption growth has been running at 2% to 2.5% annually on a much larger base than fluff and this growth has accounted for the larger share of the increased tonnage.

P&P: *When do you see paper-grade market pulp supply and demand coming into better balance?*

Gross: After the next year or two.

P&P: *Has the market for southern pine been especially weak because of the startup of two major projects in the South last year?*

Gross: The market for southern pine is not weaker than for northern kraft, sulfite, or other pulps. Southern pine is well accepted worldwide.

P&P: *Will new paper machines being installed at market pulp mills (Georgia-Pacific Corp., Hammermill Paper Co.) help the supply/demand picture after 1985?*

Gross: The immediate effect of such shifts is difficult to predict. On one hand, some market pulp is being taken off the market. On the other, increased paper production at integrated mills has the effect of taking volume from existing paper mills, many of which use market pulp. The impact is diffused. Over the medium- and long-term, however, integration is more harmful to the pulp market; the smaller the market volume is to that paper use, the more volatile the business.

TABLE 2: **ITT at a glance.**

Pulp mills[1]	**Capacity (metric tpy)**	**Grades**
Jesup, Ga.	450,000	Kraft
Fernandina Beach, Fla.	145,000	Sulfite
Hoquiam, Wash.	150,000	Sulfite
Port Angeles, Wash.	155,000	Sulfite
Total	**900,000**	
Paper mill		
Hoquiam, Wash.[2]	100,000	Uncoated free sheet
Silvichemical plants		
Hoquiam, Wash.	153,900	Spent sulfite liquor products, vanillin, VBL (a boiler fuel)
Jesup, Ga.	31,000	Tall oil, turpentine, carbon
Port Angeles, Wash.	7,200	Bio-Protein (a feed supplement)
Total	**192,100**	

Wood products plants		
Lumber mills (4)	185	million bd ft/yr
Treated wood plants (6)	22.1	million ft³/yr
Plywood plants (1)	90	million ft²

Timber resources	**Acres owned**	**Leased/ licensed**	**Total**
Northwest	360,000	69,000	**429,000**
Southeast	739,000	168,000	**907,000**
Total U.S.	**1,099,000**	**237,000**	**1,336,000**

1. All of the mills make dissolving or paper-grade market pulp (including fluff) except for Port Angeles, which has been supplying most of its output to adjacent Grays Harbor Paper Co., the idle Port Cartier, Que., dissolving pulp mill is held directly by ITT.
2. Grays Harbor Paper is jointly owned by ITT Rayonier Inc. and Hammermill Paper Co.

Source: Based on ITT Rayonier data for 1984.

The main factor that will help the supply/demand situation beyond 1985 will be continuation of steady growth in paper products that use bleached chemical pulp.

P&P: *Isn't southern pine receiving increased acceptance by papermakers in the northern U.S., western Europe and the Far East?*

Gross: Both southern pine and hardwood are nearly fully accepted worldwide.

P&P: *Don't southern pine producers face growing competition from softwood producers in Brazil, Chile, New Zealand, and other nontraditional producing regions?*

Gross: Yes. These new sources do and will affect all types of chemical pulp, not just southern pine. If a grade is found useful for papermaking, it will find its niche.

P&P: *What is the future of sulfite as a paper-grade market pulp? Hasn't sulfite almost become a specialty market in North America?*

Gross: We see little growth for sulfite paper pulp in the future. Probably a diminution of production will take place as less efficient mills phase out. In the meantime, sulfite pulps have a place in the market for many paper and specialty end uses. It also makes very good paper.

P&P: *How would you assess the competitive posture of your various mills—Jesup, Ga.; Fernandina Beach, Fla.; Port Angeles, Wash.; and Hoquiam, Wash.?*

Gross: Within each category of pulp—kraft and sulfite and dissolving, paper and fluff pulps—Rayonier mills are competitive with other U.S. producers.

As an industry, however, the market pulp business is extremely weak and we don't expect conditions to change in the near term. Foreign producers have improved their cost-competitive position because of the strong U.S. dollar.

P&P: *What steps have you taken to improve the performance of your mills?*

Gross: The company will continue to stress cost reduction at all mills with the emphasis on wood, chemicals, labor, maintenance, productivity, health care costs, and transportation. Progress has been made and we expect it to continue.

For example, in the Northwest woods we have a system called POD, which features contractor-like crews working on an incentive basis. The employees have the opportunity to earn more, and wood costs have been lowered.

At the mills, we have new efficiency programs, which are working. In May, we negotiated a new labor agreement at Grays Harbor that includes—besides efficiency items—a two-tier pay system that reduces rates for newly hired employees. This will tend to lower labor costs over time.

Of course, we continue to emphasize quality and technical capability and we also plan to continue our strong research effort.

It was research that led us into the successful development of our chemical business which is based on upgrading pulp byproduct streams. The growth of this business has been excellent and it certainly adds to the strength of our various mills. ■

Maintenance is no prize assignment

April's Engineer to Engineer column ran a survey questioning readers on the differences between engineering and maintenance departments. The results of that survey are printed below. As always we thank those of you who took the time to respond.

More than half of the responses (55%) were from mill engineers. Supervisory personnel made up the second largest group (28%). The majority of the supervisors indicated an engineering background. The engineers were predominantly assigned to the mill engineering department.

There were some interesting splits on whether or not maintenance-related projects were helpful in gaining recognition. With the responses only slightly tipped in favor of maintenance projects, a breakout of supervisors' responses was done. The supervisors' responses, too, were almost equally split: 57% yes, 43% no. It appears that a significant block of engineers in the industry feel that maintenance-related assignments are less rewarding than others. Visibility is still important, since few people enjoy working "alone in the dark."

In a related question that asked if maintenance projects had a negative connotation, 35% of the respondents said yes. In the supervisors' breakout, 29% also said yes. If close to a third of the supervisors who make assignments feel that maintenance is not as important as other projects, it is not surprising that engineers also feel this way. It would be interesting to know at what management level this attitude starts.

The combined response to the question about conflict between engineers working on joint maintenance/engineering department projects showed that 47% felt that interdepartmental conflicts exist, and 53% felt that they do not not. Only 25% of those in supervisory positions felt that conflicts exist. The responses for engineers only showed that 66% thought conflict does arise, while only 34% said it does not. These responses raise questions as to whether managers deny problems, or if engineers are overly sensitive to the give-and-take of a mill environment.

Some responses are printed below.

"I find that when there are engineers in both areas, the maintenance engineer ends up doing the engineering function and not maintenance; therefore 'maintenance engineering' is really a misnomer."
—Supervisor

"More engineers should be used in all departments, not just engineering! Today engineering talent can be (and should be) used in all operations and maintenance departments. Engineers should not be confined to the engineering department any more than chemists should only work in the lab!
—Division Manager

MATT COLEMAN
is engineering editor
for **Pulp & Paper.**
Comments should be
addressed to him at:
Pulp & Paper, *2700*
Cumberland Parkway,
N.W., Suite 530,
Atlanta, Ga. 30339.

Are you a
0% Technician
55% Engineer
28% Supervisor
17% Other

If you are an engineer and not a supervisor, are you assigned to the
64% Mill engineering department
27% Mill maintenance department
9% Operations department

At your mill are engineers assigned to
17% Engineering department only
83% Both engineering and maintenance departments
0% Neither, engineering and maintenance departments are one and the same

Do conflicts arise when both the maintenance and engineering departments have full-time engineers working in them?
47% Yes **53%** No

As an engineer, do you feel that maintenance engineering or maintenance-related projects are as helpful in gaining recognition and promotion within the company as expansion- or production-related projects?
56% Yes 44% No

Would the maintenance department at your mill be more efficient if contract maintenance were used?
26% Yes **53%** No
21% Already using contract maintenance

If your mill has separate engineering and maintenance staffs, what percentage of time does the engineering department spend working on maintenance-related projects?
11% 0% to 5%
44% 5% to 20%
17% 20% to 40%
22% 40% to 60%
6% 60% +

As an engineer, does working on "maintenance" have a negative connotation at your mill?
35% Yes **65%** No

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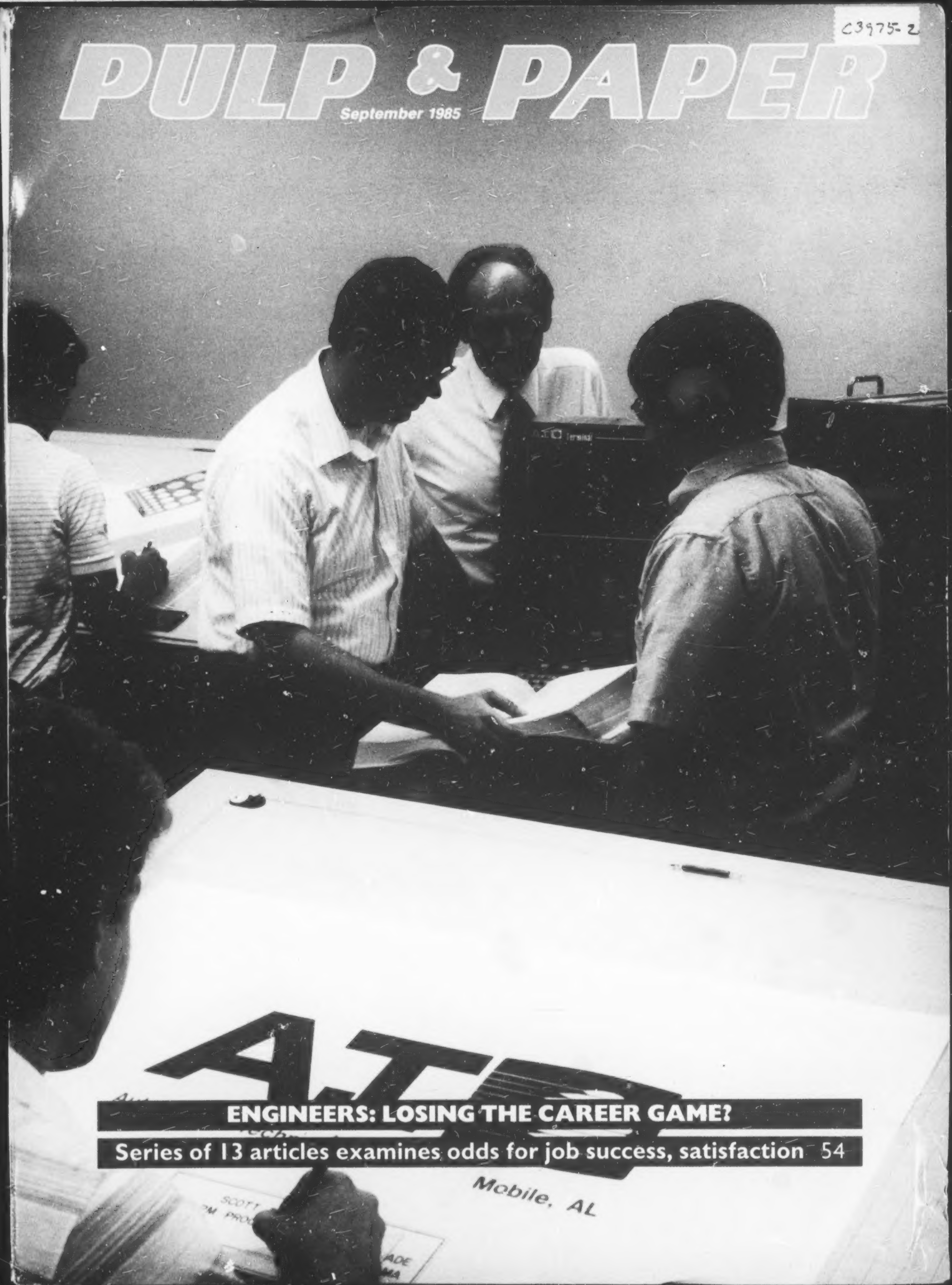
PULP & PAPER

September 1985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Office locations

AT = Atlanta: 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339; (404) 432-3186
SF = San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273
NY = New York: 370 Lexington Ave., New York, N.Y. 10017; (212) 683-9294; Telex 220442
BR = Brussels: Chaussée de Charleroi 123a, Boite 5, B-1060, Brussels, Belgium; Telex 846-24672

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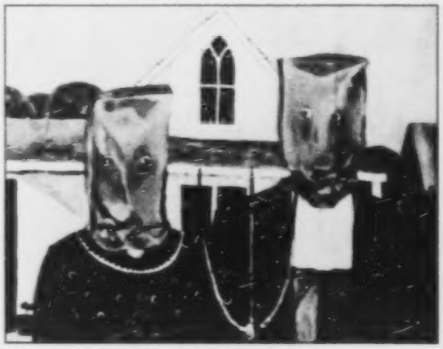

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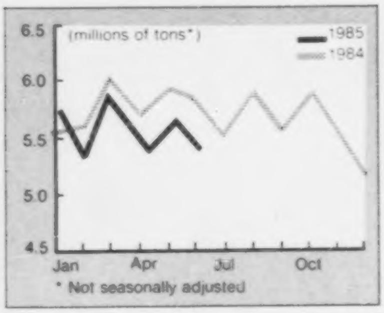
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 5.49 million tons in June, down 5.3% from a year earlier, according to American Paper Institute figures. The seasonally adjusted annual production rate through June stood at 66.6 million tpy, down 2.6% compared with the first half of 1984. Paper production slipped to a rate of 34.0 million tpy, off 1.2% from last year, while paperboard dropped 2.6% to a rate of 32.6 million tpy.

Among major grades, only tissue and uncoated free sheet exceeded year-earlier levels, rising 1.6% and 2.5%, respectively. Groundwood paper, down 8.1%, and packaging papers, down 9.5%, lost the most ground. Production in the strong coated paper segment also lagged year-earlier levels in the first half, falling 2.0% below 1984. Kraft linerboard was down 6.0% compared with last year due to continued sluggishness in export production, which was off 24.5%. Corrugated box shipments fell an adjusted 1.8% from 1984, the Fibre Box Assn. said.

Canadian newsprint shipments declined 7.7% in June, the Canadian Pulp & Paper Assn. reported. Operating rates stood at 89%, compared with 97% in 1984. Canadian pulp shipments lagged last June by 7.1%, with operating rates at 96%. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	June	449	−4.1	5,483	−2.2
Uncoated groundwood (s)	June	124	−13.3	1,472	−8.1
Coated paper (s)	June	468	−9.7	6,163	−2.0
Uncoated free sheet (s)	June	782	4.3	9,626	2.5
Other printing/writing	June	112	−10.4	1,350	−9.8
Total packaging and other paper (s)	June	418	−11.3	5,224	−9.5
Tissue	June	418	3.0	4,934	1.6
Total paper	**June**	**2,771**	**−3.8**	**34,251**	**−1.9**
Unbleached kraft paperboard	June	1,326	−11.4	16,449	−5.8
Semichemical medium	June	419	−5.4	5,017	−3.5
Bleached paperboard	June	325	−5.2	3,976	−3.0
Recycled paperboard	June	646	−4.0	7,698	−3.7
Total paperboard	**June**	**2,716**	**−8.1**	**33,141**	**−4.6**
Total U.S. paper and paperboard output	**June**	**5,487**	**−6.0**	**67,392**	**−3.3**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	May	4,532	−5.0	54,546	−2.6
Market pulp production	May	539	−3.9	6,910	1.2
Wastepaper consumption at paper/board mills	May	1,208	−13.0	15,232	−6.7
Pulpwood consumption (cords)	May	7,072	−4.9	87,036	−1.8
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	June	21,245	−5.5	133,413[6]	−1.2
Containerboard inventories at U.S. box plants and mills	June 1	2,922	−2.2		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	May	945	6.2	11,264	12.4
Imports of Canadian newsprint	May	684	11.0	8,244	13.8
U.S. paper exports (including products)	May	297	−29.8	3,913	−10.5
Exports of unbleached kraft linerboard	June	157	−11.8	1,669	−24.5
Exports of woodpulp	May	309	−8.0	3,741	1.5
Norscan pulp inventories[4]	June 30	1,449	−1.2		
Norscan pulp operating rates[4]	June	92%	79%	81%	87%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	June	733	−16.4	4,485[6]	.9
Operating rates	June	89%	97%	94%	89%
Inventories held by U.S. consumers	June 30	1,463	4.5		
Other paper/board shipments	June	237	4.4	1,493	8.7
Woodpulp shipments (export only)	June	627	−2.2	3,431[6]	8.4
Operating rates	June	96%	99%	89%	82%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = shipments.

UNCOATED GROUNDWOOD PAPER: U.S. mills slump, Canada shows growth; prices hurt by LWC softness

Grade structure: Physical properties of most uncoated groundwood paper grades are similar to newsprint, with the supercalendering and filler content of the supercalendered (SC) grades being the most notable difference. Newsprint and uncoated groundwood together constitute the low-cost end of the publication paper spectrum. Uncoated groundwood is typically of higher brightness—ranging from 64 to 72 Elrepho compared with 56 to 62 for newsprint—and greater endurance. Major end-uses include Sunday magazines, preprinted inserts, catalogs and other advertising material, directories, and forms. Basis weight range is 20 to 45 lb/3,300 ft².

Production/capacity: U.S. and Canadian production set new records in 1983 and again in 1984, and Canadian output seems likely to reach new levels in 1985 as well. But paper from Canada is taking share from U.S. mills in 1985, and U.S. output is not expected to equal 1984 levels.

Definitions of uncoated groundwood for purposes of industry statistics vary from the U.S. to Canada, and U.S. totals are believed to be more reflective of reality. Indeed, due to the oddities of U.S. tariff nomenclature, which allows Canadian producers to ship such grades as rotonews and some offset paper into the U.S. as standard newsprint, official Canadian estimates of that country's capacity—935,000 metric tons in 1985—are believed to be less than half of Canada's actual capacity.

Tracking capacity both in the U.S. and Canada can also be difficult because many machines can be swung from newsprint to groundwood specialties at will, depending on market conditions. The capacities listed here are those which are believed to be dedicated to uncoated groundwood products other than standard newsprint during 1985.

Outlook: Growth in advertising expenditure slowed down in 1985 after the explosion of the previous two years, and the entire publication papers group reflected that. Several Canadian mills have upgraded newsprint machines to make groundwood specialties in recent years. For that reason—as well as the relatively weak Canadian dollar, permitting Canadian mills to undercut U.S. prices—Canada has gained market share in the U.S. this year. Through May, Canadian shipments to the U.S. were up about 13% while U.S. mills' shipments were down by 7.6%. The overall market this year seems likely to show little growth, if any, due to customer inventory reductions early in the year followed by softness in retail sales and consequent weakness in promotional printing activity.

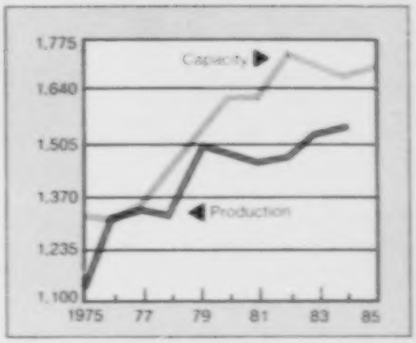
Imports from Europe have gained increasing prominence in North America in recent years. For example, Finnpap is the biggest supplier of SC to the U.S. With the softness in SC this year, import growth should stabilize, although European mills have also been making gains with machine-finished grades.

Pricing: Flat demand in the first half of 1985, loose supply in coated paper, and an ongoing surplus of newsprint produced a weak pricing situation for uncoated groundwood mills by midyear. Prices in 1985 as a whole are expected to do no more than remain level with late 1984.

List prices for some groundwood grades ($/short ton) are: 25-lb roto catalog—1974, $320; 1975, $320; 1976, $345; 1977, $405; 1978, $425; 1979, $468; 1980, $495; 1981, $551; 1982, $551; 1983, $600; 1984, $640; midyear 1985, $680.

30-lb standard rotonews—1978, $345; 1979, $386; 1980, $427; 1981, $490; 1982, $505; 1983, $505; 1984, $515; midyear 1985, $540. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1983	1984	1985e
Production¹	1,531	1,565	1,510
Capacity¹	1,710	1,693	1,710
Utilization rate	89.5%	92.4%	88.3%
Imports	920	1,298	1,360
Exports	37	30	40
Apparent U.S. consumption	2,414	2,833	2,830
lb/capita	20.69	24.06	23.80
GNP ratio	1.57	1.73	1.68

e = P & P estimate
1: American Paper Institute data

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity			Market share
	U.S.	Canada	Total	(%)
1. Abitibi	—	397	397	10.7
2. CIP	—	395	395	10.7
3. MacBlo	—	390	390	10.5
4. GNN	360	—	360	9.7
5. Boise	40	284	324	8.8
6. Champion	286	—	286	7.7
7. Con-Bath	—	285	285	7.7
8. Domtar	—	210	210	5.7
9. Madison	200	—	200	5.4
10. CZ	150	—	150	4.1

Market share of top five companies: **50.4%**

Market share of top ten companies: **81.0%**

Total U.S. capacity (1985):
1.170 million short tons

Total Candian capacity (1985):
1.991 million short tons

Total North American capacity (1985):
3.701 million short tons

SALES/EARNINGS

U.S. paper industry profits skid 19%

U.S. paper industry second-quarter earnings slid 18.9% on a 2.5% rise in sales from their year-earlier level, according to a *Pulp & Paper* survey of results from 33 companies. Of these companies, 21 reported lower earnings, but only one showed a loss.

Flat U.S. industrial activity, the strong dollar, and overcapacity in some grade segments appeared to be the major factors for the decline in net income. Weak prices in the grades most affected by these trends—linerboard, market pulp, and uncoated free sheet—were most often blamed for the lower results.

Nevertheless, companies that were concentrated in the tighter coated paper market or in the consumer-oriented tissue business were able to post gains. Results in wood products were mixed, with some companies reporting higher profits because of improvement in lumber and panel prices and various cost-cutting programs. Most companies predicted that earnings would remain under pressure in the third quarter or through the remainder of the year. But a few chief executives saw some positive signs in the recent decline in interest rates and the drop in the dollar.

Strongest performers. Unaffected by the impact of the strengthening dollar on U.S. industrial activity, most tissue producers posted higher earnings for the second quarter. One notable example is Kimberly-Clark Corp., which racked up a 34% increase in earnings on a 13% increase in sales for the second quarter of 1985, assisted by the strong performance of its diapers business.

Fort Howard Paper Co.—another strong performer—showed a 25% rise in profits on a 4% increase in sales, helped by the weakness in wastepaper prices. Scott Paper Co., on the other hand, reported flat earnings for the second quarter. Poor performance in pulp and forest products pulled down earnings.

James River Corp. reported a 6% increase in earnings, with an improved performance from its tissue operations (earlier hurt by a costly product rollout in the Northeast) offsetting lower profits from uncoated free sheet and pulp. For its entire fiscal year ended Apr. 28, James River posted a 3% increase in earnings on an 8% increase in sales.

Consolidated Papers Inc. was an outstanding performer, producing a 42% jump in profits to reach a new record. Chairman and CEO George Mead attributed the strong performance to recently completed productivity improvement, near-capacity operation, increased tax credits, and price improvements. The company commented that its two lightweight coated groundwood paper mills ran at capacity for the period's duration.

Impact of the dollar. Champion International Corp. reported an 8% increase in second-quarter earnings, "despite strength of the dollar, generally sluggish industrial activity, and increased imports of printing and writing papers." Chairman and CEO Andrew Sigler noted that demand for coated paper has softened due to im-

U.S. paper industry second-quarter results.

	Second quarter ($000)			
Companies	**Sales**	**Change 1985/84**	**Earnings[1]**	**Change 1985/84**
Boise Cascade	$952,730	−4.6%	$31,680	−5.4%
Bowater Inc.	230,566	−4.5	15,221	−8.0
Champion International[2]	1,598,836	38.8	43,346	8.0
Chesapeake	86,812	2.9	5,402	−11.4
Consolidated Papers	187,187	6.4	29,363	42.1
Crown Zellerbach	769,400	−0.3	21,500	−33.8
Federal Paper Board	191,240	30.8	1,178	−85.7
Fort Howard Paper	373,051	4.4	43,770	25.0
Georgia-Pacific	1,794,000	7.4	67,000*	1.5
P. H. Glatfelter	70,705[3]	−19.7	10,586	0.2
Great Northern Nekoosa	480,600	0.7	12,400	−64.7
Hammermill Paper	437,418	−3.5	10,814	−36.3
International Paper	1,200,000	0.0	35,200	−47.5
James River (4/28)	644,959	−5.2	34,020*	6.2
Jefferson Smurfit	161,146	−8.6	5,589	−7.6
Kimberly-Clark	1,005,100	12.8	78,900	34.0
Longview Fibre (4/30)	109,606	−13.6	4,229	−41.1
Louisiana-Pacific	344,970	6.3	4,970	−33.9
Mead	722,700	−0.5	33,100	−28.2
Mosinee Paper	46,145	−14.4	2,209	−4.2
Pentair	132,985	−7.2	6,534	9.2
Pope & Talbot	85,262	8.8	1,836	−30.1
Potlatch	248,619	−3.9	10,543	−33.8
Scott Paper	761,100	6.9	53,100	0.4
Sonoco Products	23[illegible],216	21.9	13,599	12.4
Southwest Forest Industries	178,850	−14.7	(2,876)*	n.m.
Stone Container	302,329	−3.7	1,389	−85.3
Temple-Inland	326,500	−0.9	24,200	−16.0
Union Camp	477,605	−5.9	24,715	−51.8
Wausau Paper Mills (5/31)	52,958	−3.9	2,410	13.1
Westvaco	436,226	−2.4	22,952	−18.7
Weyerhaeuser	1,400,117	−4.8	59,683	−42.5
Willamette Industries	304,083	0.0	17,646	5.3
Total	**16,910,083**	**2.5**	**726,208**	**−18.9**

1. Income after taxes from continuing operations, excluding most significant items in both years.
2. Champion results include those of former St. Regis Corp., which was acquired in late 1984.
3. Glatfelter had lower 1985 sales due to sale in Sept. 1984 of West Carrollton, Ohio, mill.

*Boise: includes $17.8 million pretax gain from sale of Newcastle, N.B., mill; Georgia-Pacific: excludes $17 million income from discontinued operations; James River: includes $3.4 million due to actuarial assumptions on pension expense; Southwest Forest: loss includes $1 million pretax gain from sale of lumber unit. n.m. = Not meaningful.

of future claims. The preferred shareholders will receive a new preferred stock, the value of which has yet to be determined.

Manville Corp., parent company of Manville Forest Products Corp., West Monroe, La., had filed for bankruptcy in 1982 after being inundated with claims by those suffering from exposure to asbestos. ■

P&G sues K-C for patent infringement of its diapers

In another effort to protect its Luvs disposable diaper brand, Procter & Gamble Co. has filed a patent infringement lawsuit against Kimberly-Clark Corp. P&G is charging that Kimberly-Clark's use of heat-shrinkable materials to form gathers in its disposable Huggies brand diapers infringes P&G's patent on the material. P&G uses the heat-shrinkable materials to form the waistband in its Luvs diapers.

Procter & Gamble said that Huggies diapers containing the material are being sold in limited markets. It is seeking a court injunction to prohibit further use of the material and is asking for unspecified damages.

- P&G was awarded about $2.4 million in damages earlier this year when a jury found that Weyerhaeuser Co.'s disposable diaper had infringed P&G's patent. ■

FORECAST

Growth ahead for Canadian domestic paper demand

Substantial growth in Canadian domestic consumption of paperboard, newsprint, and printing and writing grades is likely between now and the end of the century, according to a study just published by the Canadian Forestry Service's (CFS) Economics Branch. Growth rates are expected to be stable, continuing the trends of recent years.

That scenario is the result of forecasts which the CFS admits do not consider the possibility of changes in cost relationships, technology, or customer preferences. Thus, CFS has been forced to assume that future growth will represent a continuation of the trends that have occurred in recent years. Models being developed for future forecasts will attempt to include some microeconomic variables.

Even with this limitation, CFS believes its study represents a useful picture of a possible future. It actually presents three scenarios, including a base and pessimistic and optimistic alternatives. In some cases, the CFS analysts believe results may be closer to the extremes rather than to the base.

For example, analysts believe consumption in the year 2000 for building boards may rise only to the low end of the projected range. The pessimistic scenario foresees total growth of only 36.8% from 1984 to 2000, as opposed to the 41.5% growth of the base scenario. Factors cited include the declining proportion of the population in the major home-buying age groups, high interest rates, and competition from synthetic fibers.

Newsprint growth stunted. Newsprint is another area where growth is expected to be "in the lower portion of the projection range." In the pessimistic scenario, Canadian consumption in 2000 for newsprint is forecast at 1.34 million metric tons compared with 1.43 million tons in the optimistic scheme. Factors limiting growth are expected to include competition from electronic media—particularly regarding classified advertising—and demographic trends.

The "culture paper" group, i.e., printing/writing grades and tissue/sanitary products, will see its growth rate fall to a little over half of the nearly 6%/year rate of the 1960-80 period. Elements that will keep demand increasing at a rapid pace include "the increased popularity of magazines and more widespread use of photocopiers."

Factors curbing growth, however, would include the maturation of tissue and sanitary paper markets as new products such as diapers and paper towels are finally absorbed, plus a reduction in the average number of tissue plies due to a shift to air-laid products.

Groundwood paper grades may be subject to increased competition for advertising from electronic media. This—plus the aging of the population—will limit demand growth for groundwood paper.

Canadian domestic consumption forecast for paper and paperboard, CFS base scenario, (000 metric tons).

Product	1990	1995	2000
Paperboard	2,328	2,666	3,007
Wrapping paper	335	331	324
Newsprint	1,109	1,246	1,384
Culture paper[1]	1,896	2,295	2,722
Building boards	432	484	535

1. Printing and writing papers and tissue and sanitary papers.

Source: Canadian Forestry Service, Economics Branch.

Threat from plastic. Technological change is the major factor in continued expected declines in wrapping paper demand. CFS believes plastic displacement of paper bags in the grocery bag market will continue, although demand for shipping sacks will remain strong. The three scenarios for overall wrapping paper consumption converge in 2000 at a level more than 20% below 1974 volumes.

The report also notes that per capita consumption of wrapping paper fell by more than 30% from 1974 to 1981 due to "effective market penetration by the producers of plastic bags and cellophane wrap." CFS believes that a "potential threat exists from low-density polyethelene packaging, which is gaining more consumer acceptance in the U.S. market."

Paperboard, on the other hand, is less susceptible to competition from plastics, and demand is expected to continue rising by 2.3% annually to 2.9% a year through 2000. Milk carton stock was the only area where competition from plastics was mentioned.

The authors seem to feel that all the major groups are either mature or maturing, and thus are more vulnerable to swings in overall economic activity than might have been the case before. Economic growth is expected to "pause" in 1986, 1990, and 1995, slowing growth rates in each group during those years.

To obtain more information about this report—entitled "Canada's Domestic Consumption of Forest Products: 1960-2000," Information Report E-X-35, by Donald Roberts and Dave Luck, contact the Economics Branch of CFS in Ottawa, Ont. ■

SULFUR: Prices stable despite market's turmoil

Consumption. The top purchased chemicals for the sulfite process are sulfur and sulfur dioxide (SO_2). Each pulping operation has either a calcium, magnesium, sodium, or ammonia base depending on the recovery system involved and other factors. Different cooking methods also use caustic, sodium sulfite, and sodium carbonate. There are 35 sulfite pulping operations in Canada and 20 in the U.S. Nearly all of them prepare their cooking sulfur dioxide onsite.

Sulfur is burned at 1,000°C, cooled, and then absorbed in the chosen base. Stored acid is sent through a recovery loop to a high-pressure accumulator where heat, water vapor, and recycled SO_2mix to form the cooking liquor. The total demand for sulfur used by these mills in 1984 was approximately 315,000 metric tons—about 3% of the produced (Frasch and recovered) sulfur in these two countries.

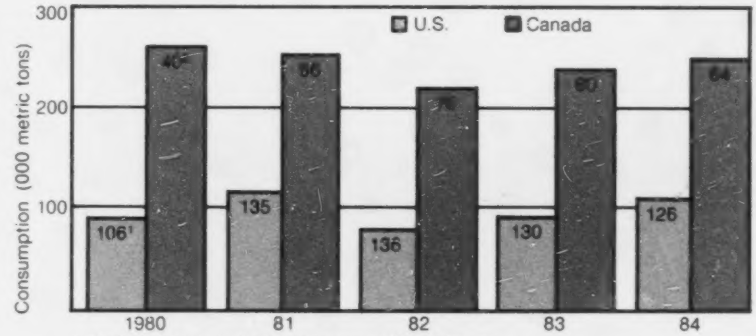
The latest entry into the sulfite pulp market was Crown Zellerbach Corp., which focused its $425-million modernization project in Camas, Wash., around a Kamyr 575-a.d.-tpd continuous digester that uses a magnifite cook. Some speculate that another unit will be sold to a Northeast manufacturer, perhaps by the end of next year.

Several technical developments have influenced sulfite pulping over the last ten years. With the closing of many small mills throughout the 1960s and 1970s (mostly due to uneconomical recovery options), existing mills have introduced modified operations and chemicals to alleviate environmental and competitive disadvantages. Among the more popular applications are high-yield pulping using sodium sulfite and sodium bisulfite, neutral pulping with anthraquinone, or combinations of both.

In addition to the pulping developments, the spent sulfite liquor is currently being examined for use in adhesives and animal feed substitutes and as a dispersant in oil recovery and construction materials preparation.

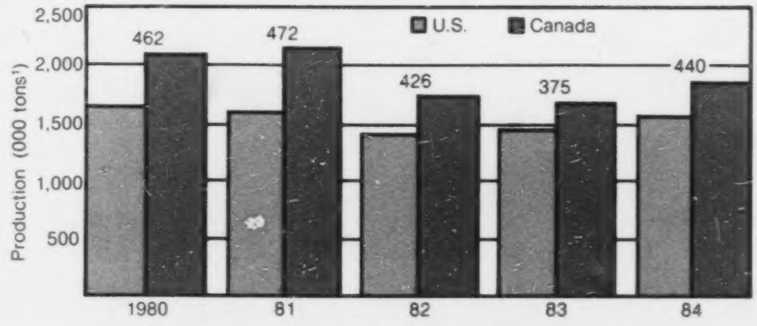
The latest commercial development is alkaline sulfite pulping—a combination of the two major processes. The cooking liquor consists of sodium sulfite and caustic soda in a rapid cook. The resulting pulp exhibits high strength and easy bleachability. Trials have been run on the new pulp in the U.S., and a full-scale plant could be operating in Canada by 1987.

FIGURE 1: **U.S. and Canadian consumption and price of sulfur.**



1. Crude, bright, f.o.b. Gulf Coast ports, US$/metric ton.
2. Crushed, slate or molten, f.o.b. producing point, C$/metric ton.

FIGURE 2: **Production and price of sulfite pulps in the U.S. and Canada.**



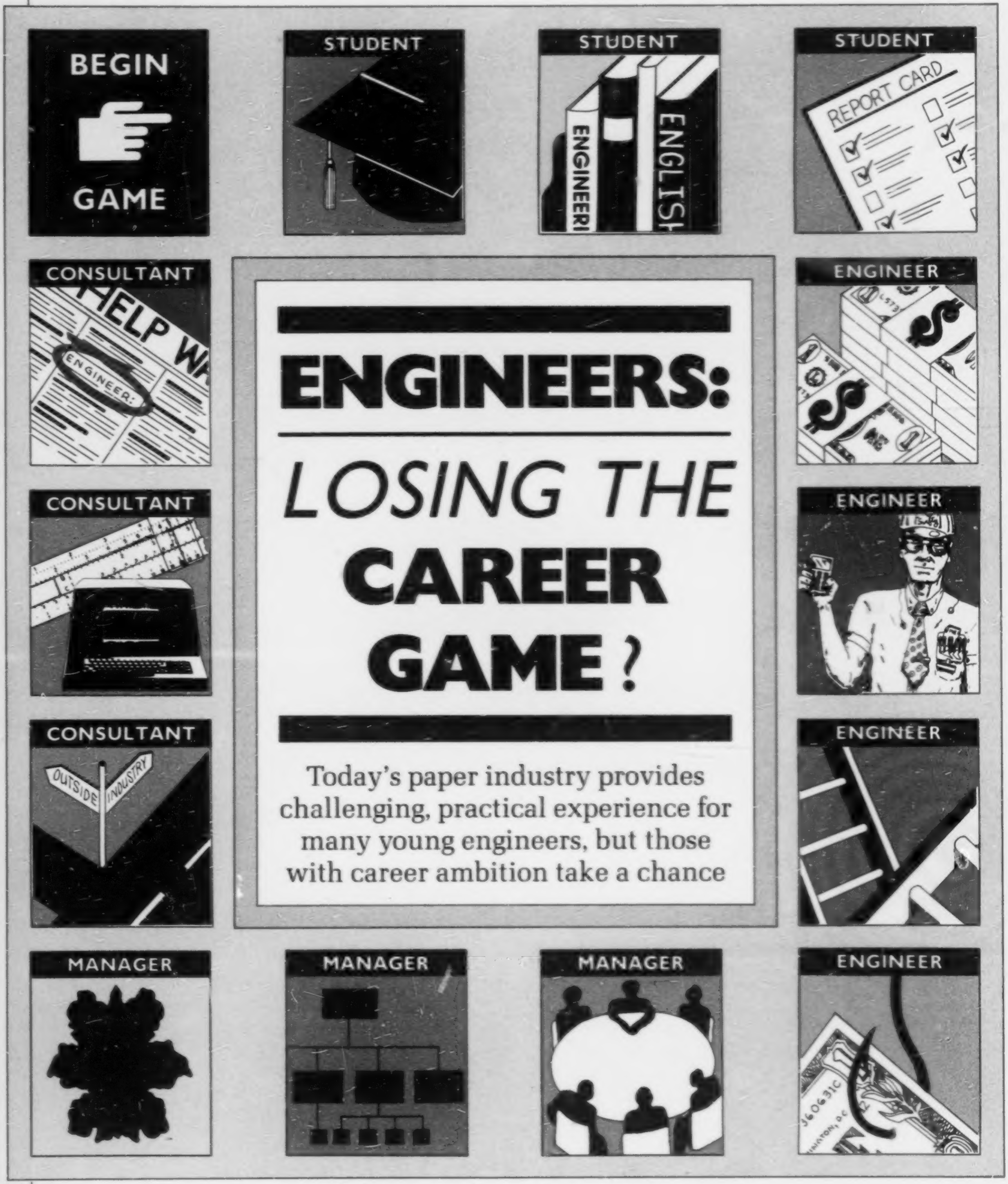
1. U.S. production given in 000 short tons, Canadian production in 000 metric tons.
2. List price (average) for North American bleached sulfite, U.S.$/ton.
Source: *P & P PriceBook*

Price. Demand has followed the economic cycles of the industry. Over the first half of this decade, a few developments have changed the nature of the sulfur market. For example, Frasch production declined while recovered sulfur production increased so that each source now supplies about 50% of the market. But production is not expected to grow enough to meet forecast demand.

Only three Frasch mines now operate in the U.S., and with oil and natural gas production down, the future of recovered sulfur is in limbo. The Canadian market, once the holder of the world's largest sulfur reserves, now face problems with exhausting its sour gas supply.

U.S. and Canadian producers have maintained price stability over the last 18 months. Most producers have raised prices two or more times during that period, but not without discounting. Prices are currently at $145/metric ton and are headed upward.

Producers are hoping that this price spiral will continue and perhaps surpass 1980's strong prices. ■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ENGINEERS: *LOSING THE* CAREER GAME?

Today's paper industry provides challenging, practical experience for many young engineers, but those with career ambition take a chance

■ The 13-article examination of engineers in this issue is in four basic parts. The first section takes a look at engineers in the "Student" stage—what today's curricula are like, how they have changed in recent years, and what's on the drawing board for the near future. A survey of graduates from one major paper engineering school rates the value of their education from the perspective of several years' experience in the industry.

Of recent concern in academia is the need for more liberal arts courses vs the push for increased specialization in the engineering disciplines, and this is covered in comments from professors at several major universities offering paper science degrees. Some faculty, students, and practicing engineers themselves feel that the direction of engineering education may remain unsettled even into the next century, as we move through a transition period in technological evolution.

The second section of this special report examines the practicing "Engineer," how he or she is faring as far as salary, promotion, job satisfaction, etc., are concerned, and exactly what the engineering "function" in the paper industry may be. This section also investigates engineers on the move—those caught in the "job-hopping syndrome"—where they are going and why. It includes a humorous view of engineers from the perspectives of various coworkers in the industry, and a comparative analysis of engineering salaries by title, location, years of experience, management level, etc.

The engineer as "Manager" is explored in the third part of this report, which looks at engineers who have made it into management and how they did it. An analysis of who's who in today's paper industry management reflects the success of engineers as they play the career game with many of their nontechnical contemporaries. Some engineer-managers find that they may be slowly losing their engineering credentials as the game progresses. Others, who have advanced to the lofty ranks of upper management as engineers, offer advice to their younger counterparts now entering or already working in the industry.

The engineer-manager section also investigates engineers who may be trapped in the professional "slow lane." What some companies are doing to prevent this is discussed in a report on management development programs currently being used in the paper industry. Completing this section is a psychological analysis of how engineers can overcome some "Achilles' heel" problems they encounter in the management arena.

The engineer who leaves the industry itself and becomes more or less a "Consultant" is considered in the fourth section. These engineers, who are usually highly motivated, career-minded individuals, often "move to the outside" in search of more challenging and creative careers. Why and how some have done this are explored in several articles. Finally, for those contemplating a career change, this section concludes with a review of how to write effective resumes. ■

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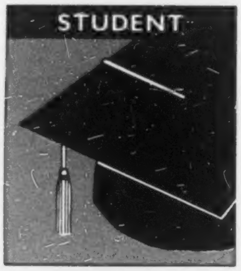


Collect Diploma: Advance Forward

TODAY'S PULP AND PAPER SCHOOLS STRESS HIGH-TECH SPECIALIZATION

By DEBORAH S. SOLLOSI, Staff Editor

Intense specialization coupled with state-of-the-art facilities and practical mill internships prepare today's students for the "real world"

■ We are living in the age of the specialist, and nowhere is this more evident than in pulp and paper science degree programs. Bachelor degree programs in pulp and paper science are characterized by highly specialized curricula and technologically sophisticated learning facilities, which reflect the strong support and influence of the industry as students are trained to meet the needs of today's mills.

Choices are narrowed early in the academic career of those preparing to enter this highly technical industry. Due to a science-oriented, heavily academic schedule, most schools leave little room for humanities courses. Two of the schools *Pulp & Paper* surveyed, Univ. of Maine, Orono, Maine, and Western Michigan Univ., Kalamazoo, Mich., do not even require freshman English. Interestingly, four of the seven schools surveyed do require a class in technical writing.

Curricula tend to emphasize either chemistry or engineering, depending on the university (Table 1), but most indicative of the trend toward specialization is the number of specialized study programs offered within individual pulp and paper departments. For example, Miami Univ., Oxford, Ohio, offers two paper science degree programs. Miami's bachelor of science degree in paper science and engineering includes in its curriculum the requirements for certification as a chemist by the American Chemical Society. Miami's bachelor of science in applied science with a major in paper science and engineering must include study in one of three fields of concentration: (1) paper science, which provides a strong science and engineering background coupled with pulp and paper technology; (2) environmental science, which emphasizes water and air pollution problems and ways in which the paper industry can solve them; and (3) process control, which concentrates on application of computer process control in the paper industry.

Similarly, North Carolina State Univ., Raleigh, N.C., offers a bachelor of science in pulp and paper science with three available courses of study. Western Michigan Univ. offers both a paper science and a paper engineering curriculum, which is further narrowed to a concentration in either manufacturing processes or environmental processes.

All schools surveyed couple their academic schedules with internships at pulp and paper mills, providing students with hands-on work experience. These internships are well-paid, professional-level jobs. Work/study programs and scholarship programs (which are often industry supported) are not uncommon. Both the State Univ. of New York, Syracuse, N.Y., and North Carolina State Univ. report that they are able to offer scholarships to all academically qualified students.

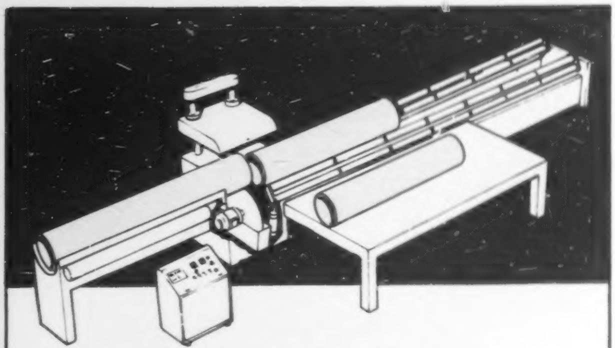
SOPHISTICATED HANDS-ON FACILITIES. Pulp and paper departments sport sophisticated machinery and scientific equipment housed in state-of-the-art facilities. Laboratories and pilot plants allow students to perform engineering calculations on simulated production systems, such as those described below.

• North Carolina State's 20,000-ft² laboratory includes complete facilities for pulp and paper manufacturing: a

TABLE 1: **Credits required for undergraduate degree at institutions offering pulp and paper programs.**

University and degree offered	**Biology**	**Chemistry**	**Computer science**	**Economics**	**Engineering—general**	**—Chemical**	**—Electrical**	**English**	**Foreign language**	**History**	**Humanities**	**Mathematics**	**Physical education**	**Physics**	**Pulp & paper science**	**Statistics**	**Social science**	**Technical writing**	**Electives (free)**	**—Humanities/social sciences**	**—Technical**	**Credits required for graduation**
Univ. of Maine, Orono Maine B.S., chemical engineering, pulp & paper curriculum	4	23			14	20	3					19	8		18				3	21		133
Miami Univ., Oxford, Ohio B.S., paper science and engineering		39	3	6				6	14			17		13	29	4			3	6		140
B.S., applied science with major in paper science and engineering	3	34	3	6				6				14	6	5	23	4		3	12	6	15[1]	140
North Carolina State Univ., Raleigh, N.C. B.S., pulp and paper science and technology 3 programs offered: (1) Chemical engineering		22				25	3	6				18	4	8	31					18		135
(2) Technology		24			2	7		6				12	4	8	34			3	9	18	6	134
(3) Science		26			2			6				15	4	8	24	3		3	9	18	16	135
Univ. of Wisconsin, Stevens Point, Wis. B.S., paper science		30						6		6		15	4	11	48		9			11		140
Western Michigan Univ., Kalamazoo, Mich. B.S., paper science		34	1								10	20	2	8	48		6	3			4	136
B.S., paper engineering 2 programs offered: . (1) Manufacturing processes		11	1		25		8				10	20	2	8	42		6	3				136
(2) Environmental processes	3	18	1		25						10	20	2	8	39		6	3			1	136
State Univ. of New York, Syracuse, N.Y. B.S., paper science and engineering	4	25	3	3	1			6			8	15		8	42				6		9	130
Univ. of Washington, Seattle, Wash. B.S., pulp and paper science		32		5	8	15		5				18		12	43	5		16		21		180[2]

1. To be taken in one of three areas of concentration.
2. Univ. of Washington credits are quarter hours; all other universities listed use semester hours.



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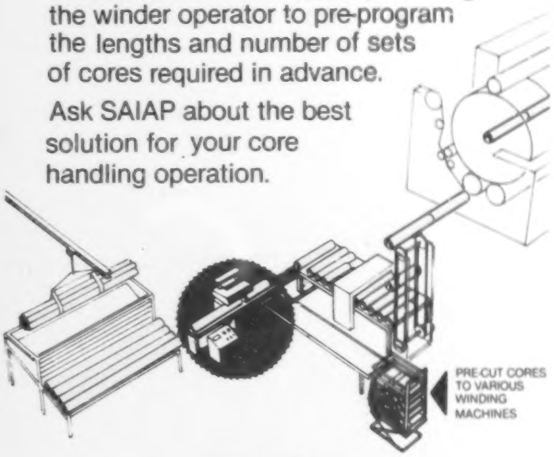

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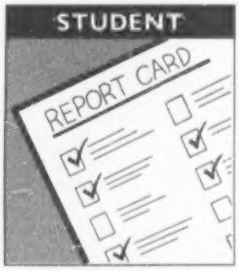
scaled-down machine; testing, coating, and environmental laboratories; and modern analytical equipment. More than 20 microcomputers, some of which are connected to mainframe computers, are available for students' use.

- Univ. of Maine has three types of laboratory facilities occupying over 30,000 ft²: basic analytical facilities, a general pilot plant, and specific project units for modern chemical engineering research. In addition, the Pulp & Paper Dept. has a sophisticated computer system, nine CRTs, a plotter, and interfaces for online data acquisition from various research instruments.
- Univ. of Wisconsin has specialized laboratories, which include microscopy (light and electron), fluid mechanics and hydraulics, physical paper testing, computers and process control, and pulp and paper engineering.
- Western Michigan Univ. maintains a "wet lab" for small-scale paper preparation, a coating lab for coating and sizing paper samples, and a microscopy lab fitted with optical microscopes for fiber identification. Electron microscopes are also available for surface studies. A completely outfitted pilot paper plant and a pilot fiber plant are available for student use.
- State Univ. of New York, College of Environmental Science & Forestry, Syracuse, N.Y., has a pilot plant for instruction and research. The college also has an environmental engineering lab to give students experience in wastewater treatment and wastepaper recycling. A modern chemical engineering lab is used to study all phases of unit operations and processes, process control, and analog simulation.

The list goes on. The universities rely heavily on industry support, often through university foundations, to build, supply, and maintain these facilities. The Syracuse Pulp & Paper Foundation at the State Univ. of New York, College of Environmental Science & Forestry, has taken this relationship one step further to what it terms a "partnership with industry." Member corporations and individuals of the Syracuse Foundation have made possible two major facilities at the college: the pilot plant and the environmental engineering lab. The pilot plant is not only used for student instruction and research, it is also used for pilot projects and tests contracted for by paper industry clients.

Ross S. Whaley, president of the State Univ. of New York, College of Environmental Science & Forestry, commented on the unique relationship his university has with industry: "An understandable industry position might be that education is too important to leave to the schools. But whatever its motives—financial, educational, a need for pioneering research or a desire for well-trained, entry-level personnel—industry has a large stake in the quality and direction of higher education. I think it's safe to forecast that the relationship between industry and higher education will grow even more intimate in the decade ahead, to the direct benefit of both institutions." ■



Alma Mater Makes Grade: Roll Again

MIAMI U CURRICULUM GETS HIGH MARKS FROM ALUMNI, EMPLOYERS

By ROBERT D. FRAIK

But both graduates and employers stress the need for more courses in communication skills, according to two recent Miami Univ. surveys

■ The Academic Committee of the Miami Univ. Pulp & Paper Foundation recently analyzed responses from two surveys conducted to evaluate the Paper Science & Engineering curriculum. The responses from 242 alumni and 74 industry employers to surveys designed for each group gave the committee the objective criteria for evaluation. Survey results are being published because they cover topics of general interest as well as those specific to the curriculum.

In the first survey, Miami Univ. Paper Science graduates were asked to gauge how well the school prepared them for their careers. Both technical and nontechnical courses were evaluated on their relevance and importance to the development of the graduate's overall career path.

The second survey was designed to determine future demand for graduates and the skills paper manufacturers and allied companies deemed important when hiring graduates.

GOOD SURVEY PARTICIPATION. Miami Univ. first offered the Paper Science & Engineering curriculum in 1957. Since the curriculum's inception, 485 undergraduate and 49 graduate degrees have been awarded. All graduates of the curriculum with known addresses were surveyed.

TABLE 1: **Years since graduation (alumni response).**

Years since graduation	Percent
1–5	46
6–9	22
10–13	15
14–17	10
18–22	7
Total	**100%**

Mean years since graduation: 6

TABLE 2: **Graduate school attendance (alumni response).**

Attendance at graduate school	Percent
Science/engineering	5
Business administration	20
Pulp & paper science	18
Other	3
No graduate school	54
Total	**100%**

Mr. Fraik is manager, quality assurance and product development, Beckett Paper Co., Hamilton, Ohio. He was chairman of the Academic Committee of the Miami Univ. Pulp & Paper Foundation, which conducted the surveys discussed in this article. Other committee members were George Alderfer, James River Corp.; Roger Bart, Union Camp Corp.; Roger Kilburn, Ralston Purina Co.; David Ormerod, Calgon Corp.; James V. Robinson, Mead Corp. (retired); William Scott, Miami Univ. (department chairman); Edward Strazdins, American Cyanamid Co.; and Allen Springer, Miami Univ.

TABLE 3: **Anticipated demand for graduates, (employer response).**

Employment group	Percent of total response	Greater demand (%)	Same demand (%)	Less demand (%)
Paper manufacturers	41.6	24	76	0
Chemical suppliers	31.7	37	58	5
Equipment manufacturers	23.3	50	41	9
Construction & engineering	3.4	50	50	0
Weighted average	—	**35**	**61**	**4**

The employer survey was sent to 200 executives employed by paper manufacturing companies and companies allied to the paper industry. The mailing list included all corporate members of the Miami Univ. Pulp & Paper Foundation and corporate members of the Technical Assn. of the Pulp & Paper Industry (TAPPI).

A total of 242 alumni responded to the survey, or 54% of those surveyed. The average time elapsed since graduation for respondents was six years (Table 1). While the relative inexperience of the respondents made it difficult to detect trends, it did provide feedback on the curriculum changes made in recent years.

Forty-six percent of alumni respondents had attended graduate school. Business administration and pulp and paper science graduate schools were selected by 79% of those students attending graduate school as shown in Table 2.

Seventy-four employers (37%) responded to the survey. Employer response included 42% from paper manufacturing companies, 32% from chemical suppliers, 23% from equipment suppliers, and 3% from construction and engineering firms.

EMPLOYMENT TRENDS AND DEMAND. An increase in demand for pulp and paper science graduates was indicated by all groups of employers surveyed. Employer response indicated those companies allied to paper manufacturers may provide more employment opportunity for graduates than in the past (Table 3). When compared with the history of alumni employment (Table 4), an increase in graduate recruitment by the allied companies could indicate a trend. The allied companies may be "growing their own" experienced technical personnel rather than hiring experienced graduates from paper manufacturing firms.

There also appears to be a trend to leave the paper and allied companies. An option entitled "other" was included for response on company classifications not listed. Respondents using the "other" category were mainly employed outside the industry. While 6% of alumni surveyed started in positions outside the industry, 10% are currently working outside the industry (Table 4).

Process engineering, technical sales and service, and research positions represented more than 80% of start-

TABLE 6: **Relevance and importance of courses offered (alumni response).**

Course	Number of semester credit hours	Percent response High	Percent response Average	Percent response Low	Course	Number of semester credit hours	Percent response High	Percent response Average	Percent response Low
Freshman year					**Sophomore year**				
General Chemistry	10	71.2	26.3	2.5	Organic Chemistry	10	53.1	38.7	8.2
Comp. & Literature	6	43.0	39.8	17.2	Engineering Statistics	4	64.7	31.6	3.7
Calculus	10	31.4	51.1	17.5	Differential Equations	4	16.2	50.9	32.9
Intro. to Paper Science	2	67.2	28.6	4.2	Principles of Economics	3	31.5	51.5	17.0
Paper Testing	2	64.6	31.3	4.1	Papermaking	4	76.7	21.2	2.1
Intro. to Data Analysis	2	73.9	25.1	1.0	FORTRAN Programming	3	49.2	38.9	11.9
Paper Properties	2	68.5	29.1	2.4	Environmental Science	3	29.7	54.6	15.7
Junior year					**Senior year**				
Quantitative Analysis	4	35.3	48.6	16.1	Heat Transfer	3	59.2	37.0	3.8
Material & Energy Balance	3	74.6	24.4	1.0	Mass Transfer	3	59.5	36.6	3.9
Fluid Mechanics	3	58.9	35.7	5.4	Physical Chemistry	6	25.2	47.4	27.4
Physics	8	27.8	54.6	17.6	Wood Chemistry	3	42.4	49.5	8.1
Pulping	5	75.7	21.6	2.7	Technical Writing	3	79.9	16.8	3.3
Fiber Microscopy	1	22.2	54.0	23.8	Paper Physics	3	46.0	46.0	8.0
Engineering Economics	3	51.7	44.2	4.1					

TABLE 4: **Alumni employment by company type.**

Type of company	Initial position (%)	Current position (%)
Sales/marketing	1	4
Pulp/paper	69	57
Chemical	10	15
Equipment	7	8
Converting	5	4
Engineering	2	2
Other	6	10
Total	**100**	**100**

TABLE 5: **Alumni employment by position.**

Position	Initial (%)	Current (%)
Process engineer	44	21
Product development	6	7
Technical sales/service	22	19
Production	3	13
Research	16	12
General management	0	8
Other	9	20
Total	**100**	**100**

ing positions for alumni (Table 5). Moving from process engineering to production and general management was the major change between the alumni's starting and current positions.

RESPONSE ON CURRICULUM. Alumni feedback on curriculum was solicited in two ways. First, each alumnus was asked to rate each course of the current four-year curriculum for relevance and importance. A high, average, and low rating scale was used (Table 6). Since courses have been added and dropped over the years, most respondents were not able to evaluate all courses covered.

To rank the importance of alumni response for all courses, the percentage of low response was subtracted from the percentage of high response to determine the net response for each course. Average responses were considered neutral and were not used. The ranking of the 27 courses is shown in Table 7.

Write-in comments was the other method of alumni input. Comments on courses were grouped by course and topic. While many of the comments were unique to the respondent, the 12 topics most often mentioned are listed in Table 8. In all cases, the alumni suggested increased emphasis on the topic mentioned.

The employer survey rated desired skills and courses intended to develop skills. It also had a write-in response. Table 9 shows the results from the multiple-choice and write-in response of the employer survey.

The strong socially oriented response to the technically oriented surveys is significant. The ability to communicate effectively was given top priority by both alumni and employers. The numerous comments encouraging improved "people skills" were made even though the university requirements have included six credit hours of humanities and six hours of social science since the inception of the Paper Science & Engineering curriculum.

In view of the results and the ongoing debate on liberal vs specific curricula, it is unfortunate the liberal courses were not included in the surveys. While the responses suggest more emphasis on liberal courses, a change in the nature of the liberal courses may be indicated. This is one explanation for the number one rank

TABLE 7: **Course rating by alumni.**

Rank	Course title	High − low (%)
1	Technical Writing	76.3
2	Papermaking	75.1
3	Material & Energy Balance	73.6
4	Pulping	73.0
5	Data Analysis	72.9
6	General Chemistry	68.7
7	Paper Properties	66.1
8	Paper Science	63.0
9	Engineering Statistics	61.0
10	Paper Testing	60.5
11	Mass Transfer	55.6
12	Heat Transfer	55.4
13	Fluid Mechanics	53.5
14	Engineering Economics	47.6
15	Organic Chemistry	44.9
16	Paper Physics	38.0
17	Fortran	37.3
18	Wood Chemistry	34.3
19	Composition & Literature	25.8
20	Quantitative Analysis	19.2
21	Principles of Economics	14.5
22	Calculus	13.9
23	Environment	13.3
24	Physics	10.2
25	Fiber Microscopy	−1.6
26	Physical Chemistry	−2.2
27	Differential Equations	−16.7

TABLE 8: **Alumni write-in comments.**

Rank	Topic	Number of comments
1	Computer Programming (replace FORTRAN with BASIC)	42
2	Technical Communications & Behavioral Science	34
3	Process Control & Simulation	29
4	Basic Engineering	25
5	Business Marketing	22
6	Papermaking & Equipment (practical, hands-on)	18
7	Pulping, Bleaching, Recovery, Power	17
8	Management	15
9	Statistics	14
10	Co-op & summer experience	14
11	Cylinder Machinery, Secondary Fiber	9
12	Coatings, Converting, Printing	9

of Technical Writing while Composition & Literature is far down the list on the alumni survey. Another interpretation is that training to develop the "language of technology" may not be compatible with the language taught in liberal courses.

The high level of participation from alumni indicated that they appreciated the opportunity to comment on their education. This approach should be considered by other academic institutions when evaluating their own programs. ■

TABLE 9: **Relative importance of course content (employer response).**

Rating	Multiple choice response	Write-in response
Most essential	1. Written communication skills	1. Report writing
	2. Oral communication skills	2. Presentations
Essential	3. Basic Engineering	3. Computer skills
	4. Basic Papermaking	4. Business & Management
	5. Chemical Engineering	5. Marketing
Desired	6. Computer skills	—
	7. Basic Pulping	—
	8. Process Control	—
	9. Business skills	—
Less important	10. Summer work experience	—
	11. Environmental & Energy Science	—
	12. Co-op experience	—
	13. Statistics	—
	14. Advanced Papermaking	—
	15. Advanced Pulping	—
	16. Basic Converting	—

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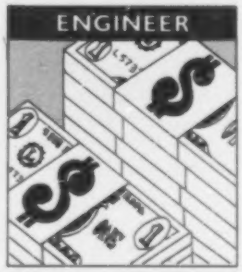


Move Up: Collect Bonus

HIGHEST PAID ENGINEERS FOUND IN MANAGEMENT AND MARKETING

By KENNETH E. SMITH, Executive Editor

Paper industry engineers were paid a median salary of $40,000 last year—fourth highest of top 16 industries; top pay went to supervisory levels

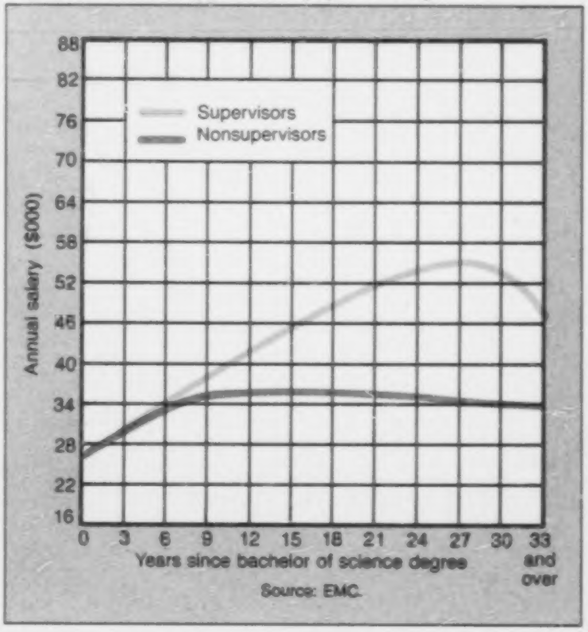
■ Engineers who want to earn the highest salaries will have to go into management, business, or sales. This is the conclusion of every recent survey of engineers working in the U.S. The survey conducted last year by the Engineering Manpower Commission (EMC) of the American Assn. of Engineering Societies showed that engineers in the paper industry were paid a median salary of $40,000. This figure compared very favorably with 16 other major industries. Paper industry engineers ranked fourth overall in the survey. Nonsupervisory engineers were paid an average median salary of only $33,000, however, while supervisory engineers earned an average median salary of $43,100 (Figure 1).

Pulp & Paper's 1984 survey of its readers showed a better weighted average median salary of $44,000 for readers with bachelor's degrees in the six engineering disciplines highlighted in Table 1. Readers with bachelor's degrees in business ($49,000) and liberal arts ($50,000), however, did considerably better—presumably because they are working in upper management or sales and marketing. In fact, P&P's survey (Table 2) showed that respondents who reported their principal job function as administration had the highest median salary ($58,000).

Other high-paying job functions were consulting ($50,000), and sales and marketing ($49,000). Engineers actually practicing basic engineering in the industry, i.e., those listing engineering design and engineering/maintenance as principal job functions, reported median salaries lower than the average at $43,000 and $40,000, respectively. Table 3 confirms the relationship between increased supervisory responsibility and better pay.

NSPE SURVEY RESULTS. The National Society of Professional Engineers' (NSPE) 1984 survey of its 62,371

FIGURE 1: **Engineering Manpower Commission's comparison of engineers' median salaries in the paper industry.**



Source: EMC.

TABLE 1: **Income and educational field—bachelor's degree only—all respondents to *P&P* survey.**

Discipline	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Percent change in median 1983-84	Percent response
Forestry/agriculture	30	39	43	65	83	22	3.5
Chemistry	33	38	48	56	68	20	9.8
Mechanical engineering	32	35	44	58	68	2	16.7
Chemical engineering	31	36	48	58	73	8	14.4
Civil engineering	34	36	45	55	64	12	4.2
Electrical engineering	32	37	48	54	63	11	5.4
Industrial engineering	29	37	44	56	82	7	2.3
Mathematics/physics	33	37	46	55	75	15	1.5
Computer science	25	25	25	25	25	−40	0.1
Biology/life science	27	29	35	42	53	2	2.0
Paper science & technology	29	33	41	51	65	7	13.1
Environmental science	29	36	38	46	51	−9	1.0
Business	31	37	49	59	78	13	18.1
Liberal arts	29	37	50	63	72	2	2.8
Other	30	34	44	58	80	−2	5.1

members yielded similar findings. The median annual income (salary, fees, cash bonuses, and commissions) of survey participants was $43,017. According to the NSPE (Figure 2), engineers in executive and administrative positions were the highest-paid respondents with a median annual salary of $51,000, followed by those in sales and marketing ($43,484), and R&D ($43,000). Engineers working in the design field, those in construction supervision, and those in production, quality control, maintenance, etc., fared least well ($37,500, $38,000, and $38,185, respectively). Teaching/training and project study and analysis fell in the middle ($40,100 and $39,800, respectively).

Engineers employed by petroleum and coal product producers had a median income of $50,675—the highest of the 25 groups reported (Figure 3). This group was followed by those employed by pipeline utilities ($47,950). Communication services and chemical, pharmaceutical, and allied products manufacturers—pulp and paper falls into the latter category—came in next at $47,000. The lowest median incomes were received by employees of state and local governments and the federal gov-

TABLE 2: **Income and principal work function, all respondents to *P&P* survey.**

Principal function	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Percent change in median 1983-84	Percent response
Administration	34	46	58	82	122	18	10.2
Research & development	31	37	45	55	66	9	9.2
Consulting	28	36	50	60	70	6	3.8
Engineering design	30	35	43	53	64	4	14.4
Teaching/academic	39	39	39	39	39	29	0.1
Product development	28	31	38	54	57	−4	1.8
Production & mill/plant operation	33	36	45	55	71	4	17.0
Engineering/maintenance	31	35	40	48	60	2	10.3
Sales and marketing	30	38	49	58	75	2	10.5
Technical service/quality control	29	33	39	46	54	8	14.2
Other	27	33	40	58	72	−2	8.5

TABLE 3: **Income and level of supervisory responsibility, all respondents to *P&P* survey.**

	Income ($1,000)						
Supervisory responsibility	**Lower decile**	**Lower quartile**	**Median**	**Upper quartile**	**Upper decile**	**Percent change in median 1983-84**	**Percent response**
None	27	30	36	44	50	9	12.0
Indirect or staff	29	33	39	47	56	5	23.0
Team or unit	30	35	42	50	56	7	14.9
Project or section	32	36	45	54	60	7	18.9
Major department or division management	35	45	54	68	83	7	25.5
Corporate management of organization	38	51	70	104	150	9	5.6

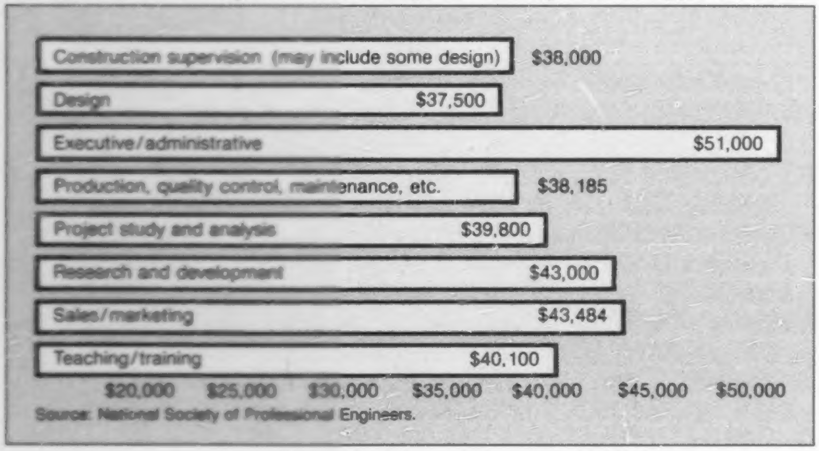
ernment ($37,000, $37,681, and $40,869, respectively). Engineers employed by manufacturers of fabricated metal products and transportation equipment also fared poorly ($41,000 and $41,211, respectively).

The NSPE survey found that supervisory/managerial responsibility plays a major role in determining income (Figure 4). For example, respondents in nonsupervisory positions had a median income of $36,895, while those who supervised one or two engineers, scientists, and/or technologists received $38,000. The median income for those respondents who directed the activities of 50 or more such professionals ranged from $38,000 to $64,500.

The income of respondents with supervisory or managerial responsibility over clerical, construction, maintenance, and/or production employees rose rapidly from $34,895 for those who supervised three to nine subordinates to $69,000 for those who directed 500 or more such employees.

MORE RESPONSIBILITY, MORE PAY. It is significant that the *Pulp & Paper*, EMC, and NSPE surveys all found that job function and supervisory responsibility—along

FIGURE 2: **National Society of Professional Engineers' ranking of income by job function.**



Source: National Society of Professional Engineers.

with experience—were the determining factors in salary level. Other factors such as geographic and size of the employing organization were not nearly as significant.

For many engineers, gaining increased responsibility often means moving away from practicing engineering in the traditional sense. (*Editor's note*: The merits and problems of such moves are discussed in detail in other articles in this special issue.) However, this does not mean that career engineers will not earn a good living compared with other professionals. The U.S. Bureau of Labor Statistics (BLS) has collected data on weekly earnings by demographic group since 1979. Table 4 presents the annual earnings of the 11 top-salaried groups surveyed in 1984. The figures are based on averages of the weekly earnings of full-time employed wage and salaried workers.

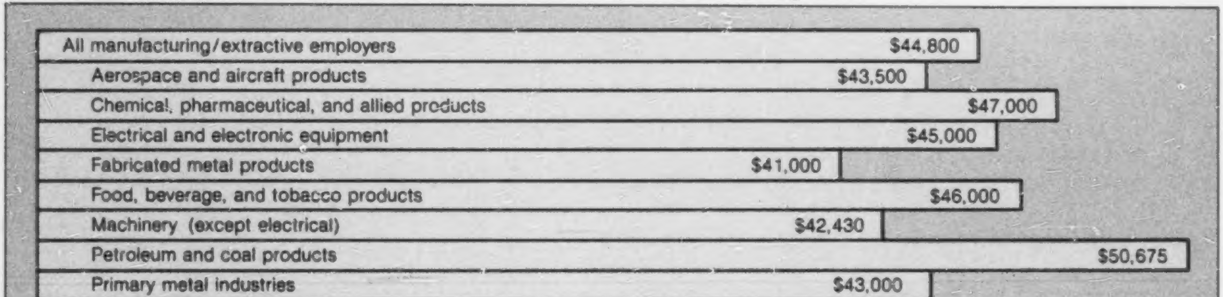
The BLS survey also divides engineers into eight work-level categories according to a combination of factors, including technical complexity of work, level of re-

TABLE 4: **Bureau of Labor Statistics comparison of top earning professions.**

		Median ($)		Mean ($)	
Occupation	**Number surveyed**	**Salary**	**Standard error**	**Salary**	**Standard error**
Engineers					
Aerospace	74	36,392	1,206	34,956	1,102
Petroleum	31	35,197	4,363	37,452	1,710
Chemical	56	33,905	2,152	35,209	1,307
Nuclear	17	47,507	2,692	43,950	1,939
Electrical & electronic	469	33,972	548	34,188	456
Marine & naval architects	20	42,031	4,382	40,532	2,396
Scientists					
Physicists & astronomers	29	36,615	4,373	34,905	2,129
Geologists & geodesists	42	41,777	4,752	38,654	1,896
Physical, other	12	36,195	4,007	34,797	2,735
Legal					
Lawyers	308	35,110	1,405	35,365	714
Judges	25	48,630	5,028	40,556	2,626

Source: Bureau of Labor Statistics.

FIGURE 3: **Income by industry or service of employer, National Society of Professional Engineers.**



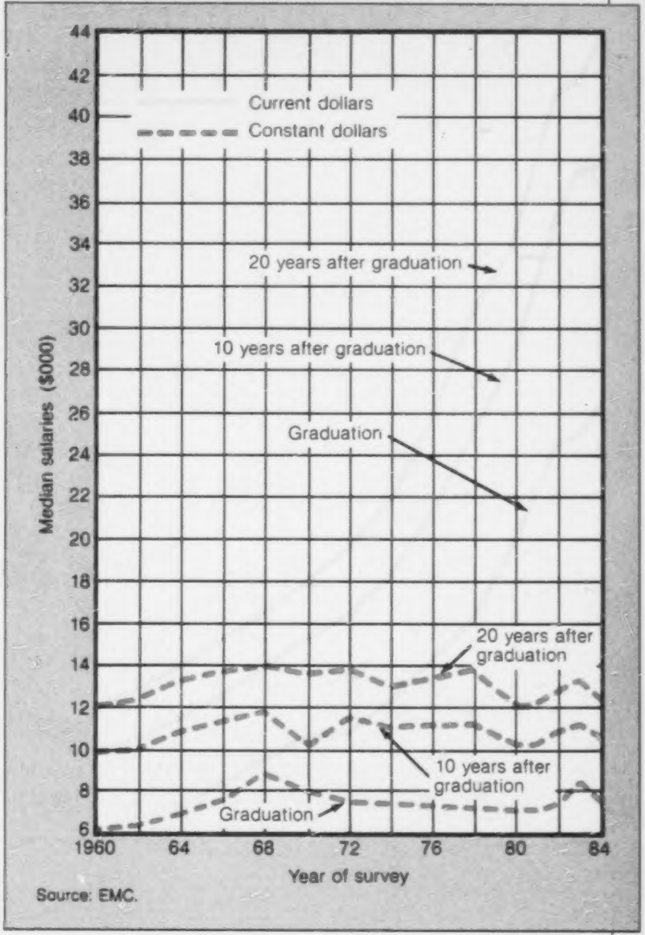
Source: National Society of Professional Engineers.

sponsibility, and scope of authority. Salary is matched with the level of responsibility in a progression of steps headed by Level 8 engineers in 1984 at an average salary of $70,788. Usually a Level 8 engineer is a company's top engineer with full responsibility over a broad, highly complex, and diversified engineering program. The top engineer directs several high-level subordinates, each of whom directs large, important segments of the engineering program.

Average salaries in other BLS categories were $28,899 for Level 2, $32,761 for Level 3, $39,005 for Level 4, $46,349 for Level 5, $53,749 for Level 6, and $61,166 for Level 7. According to the BLS, the greatest number of engineers are in Level 4, which is structured to include "professionals who are fully competent in all technical aspects of their assignments, work with considerable independence, and, in some cases, supervise a few professional and technical workers."

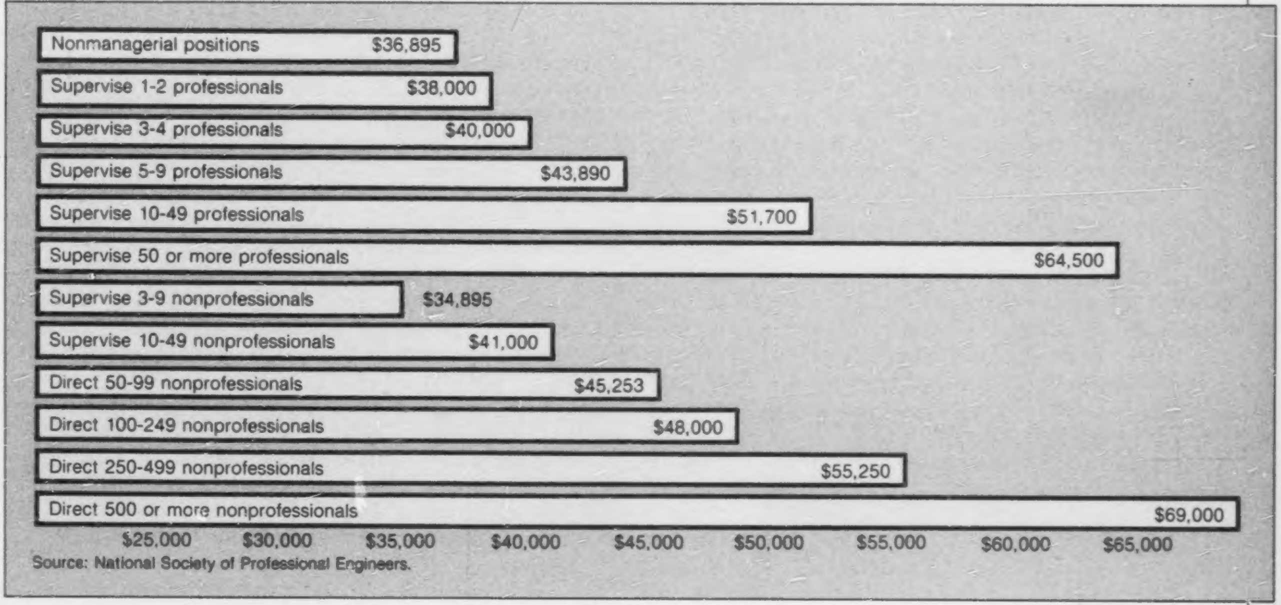
Thus, the majority of engineers, with or without supervisory responsibility, earn a salary that compares favorably with several other respected professions. All engineers, however, have to be concerned with whether their salaries have kept pace and will continue to keep pace with the cost of living. Figure 5, from the EMC survey, shows that salary increases for engineers during the past 24 years have not translated into increased buying power. Thus, it seems likely that engineers will continue to seek advancement and increased responsibility because of the compensation that goes with it. For most of them, this will mean moving away from "traditional" engineering. ■

FIGURE 5: **Trends in median salaries of engineers, 1960-84.**

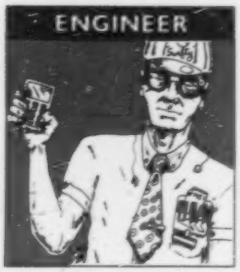


Source: EMC.

FIGURE 4: **Income by supervisory/managerial responsibility, National Society of Professional Engineers.**



Source: National Society of Professional Engineers.



Caught with Pocket Protector: Skip a Turn

PAPER INDUSTRY ENGINEERS NOT HAPPY WITH IMAGE OR PROSPECTS

By MATTHEW J. COLEMAN, Engineering Editor

"We're tired of being stereotyped," engineers complain. They are also dissatisfied with their prospects for promotion and salary compression

■ Engineers in the paper industry is the focus of *Pulp & Paper's* bimonthly *Engineer to Engineer* column. This column provides a forum for engineers to express their opinions on subjects of interest and gather feedback. Engineers, like all professionals, have concerns about jobs and careers, including concerns about image, salary, promotions, professional standing, and access to modern technology. The following profile of engineers taken from *Engineer to Engineer* columns has been assembled to give a better idea of what is important to engineers in the pulp and paper industry. Specifically, this article covers image, promotions, and salaries.

ENGINEERS ON DISPLAY. Engineers in the paper industry resent being stereotyped. They don't like being portrayed as somewhat eccentric, strangely dressed slide rule jockeys, good at numbers but not necessarily good at the English language. Most take their jobs seriously and feel they play a vital role in keeping the industry progressive and efficient.

Typically, engineers see themselves as conservative individuals who are logical, analytical, practical, factual, creative, and oriented toward math and computers. They believe that engineers have a well-rounded education, understand the business side of industry, work well with people, and have management potential. But nonengineering employees don't agree with many of these perceptions.

Basically, these are the results of an engineer profile survey that ran in the May 1984 *Engineer to Engineer* column (*P&P*, May 1984, p. 159). The first part of the quiz was actually conceived as a tongue-in-cheek look at engineers, but several questions obviously touched on subjects of general concern to most respondents.

Engineers and nonengineers generally agreed on many of the typical engineer characteristics, but engineers seem to be unaware of some impressions they give to nonengineers. How these impressions are formed is beyond the scope of this article, but responses to several questions possibly provide an indication.

For example, the statement that engineers are condescending to nontechnical people drew a 69% negative response from engineers, but 58% of the nontechnical employees felt it was true.

Engineering and nonengineering types may also have differing views on what is important to the successful operation of a business or industry: the knowledge and training that comes with taking "harder" technical courses in college or the advantages of more subjective, but critical "arts" such as communications. We can assume that nonengineers consider good communication skills important in their businesses, and 67% thought engineers were deficient in this regard. Engineers (71%) disagreed.

The fact that nonengineers also disagreed overwhelmingly with engineers on the questions of well-rounded education, understanding the business side of things, being creative, and working well with people further indicates that engineers may not be fully attuned to the impressions they make on their nontechnical peers.

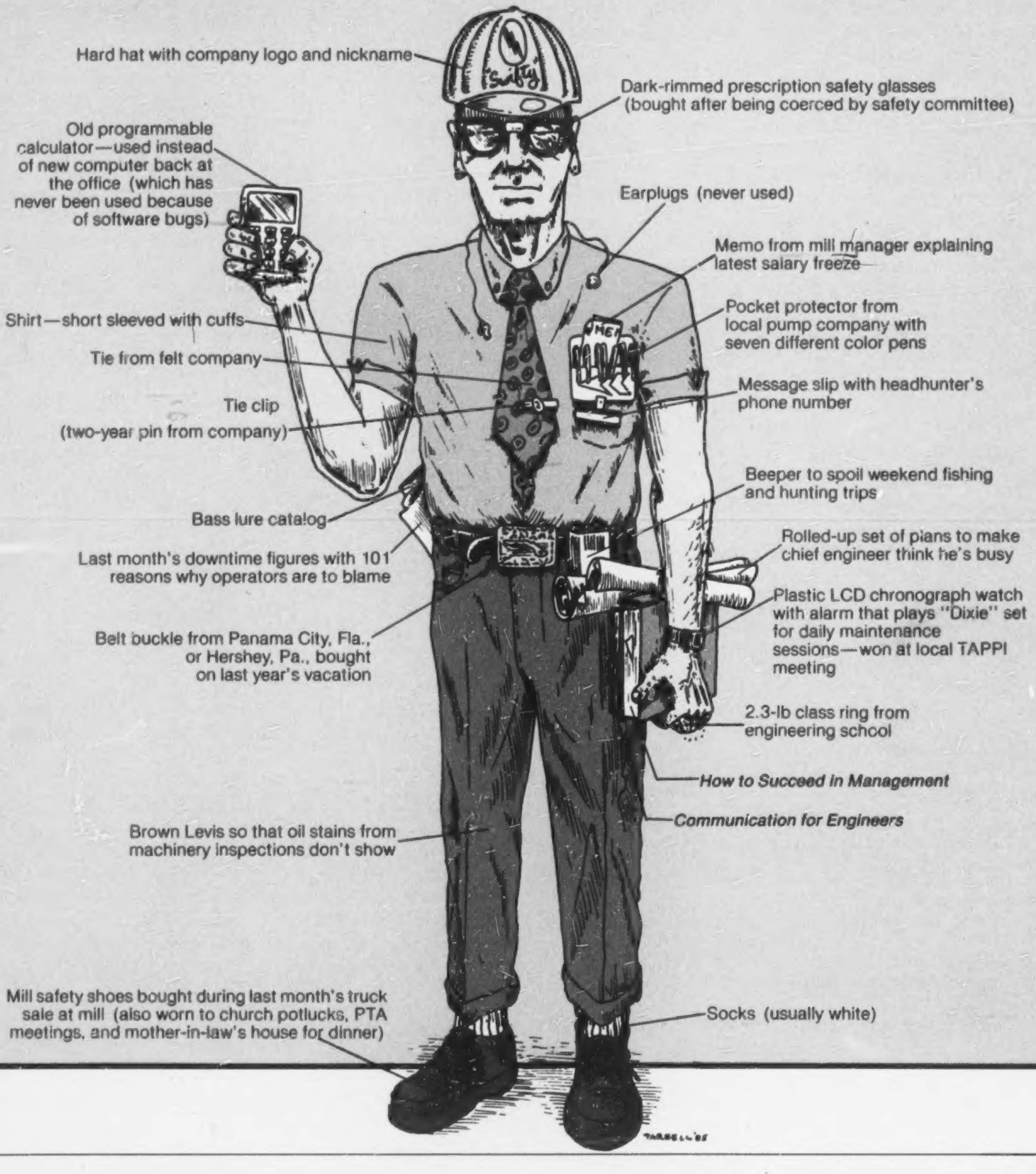
Most respondents gave straightforward answers to

DOES THE STEEL-TOED SHOE FIT?

Can an engineer be spotted in a crowd? Is there something about the way they dress, how they walk and talk? Do they behave strangely, think differently, have funny ways of doing things? Not really.

At least engineers themselves don't think so, and, in general, most people agree, as *Pulp & Paper* surveys have shown during the past year or so. But some nontechnical coworkers do see a stereotypical engineer—one who they could pick out in a crowd, one who simply by "image" alone would be called an "engineer."

For fun, the following composite sketch reflects some of these stereotypical perceptions, but obviously this is not intended to be a serious depiction of an engineer. Like all people, engineers cannot be so easily categorized.


Hard hat with company logo and nickname
Safty
Dark-rimmed prescription safety glasses (bought after being coerced by safety committee)
Old programmable calculator—used instead of new computer back at the office (which has never been used because of software bugs)
Earplugs (never used)
Memo from mill manager explaining latest salary freeze
Pocket protector from local pump company with seven different color pens
MET
Shirt—short sleeved with cuffs
Tie from felt company
Message slip with headhunter's phone number
Tie clip (two-year pin from company)
Beeper to spoil weekend fishing and hunting trips
Bass lure catalog
Rolled-up set of plans to make chief engineer think he's busy
Last month's downtime figures with 101 reasons why operators are to blame
Plastic LCD chronograph watch with alarm that plays "Dixie" set for daily maintenance sessions—won at local TAPPI meeting
Belt buckle from Panama City, Fla., or Hershey, Pa., bought on last year's vacation
2.3-lb class ring from engineering school
How to Succeed in Management
Communication for Engineers
Brown Levis so that oil stains from machinery inspections don't show
Mill safety shoes bought during last month's truck sale at mill (also worn to church potlucks, PTA meetings, and mother-in-law's house for dinner)
Socks (usually white)

questions on the personal eccentricities of engineers. Reported observations by many people, however, (including this editor) are that at least around some offices, pocket protectors, white socks with black shoes, and other forms of personal expression appear more often than is acknowledged. Some respondents caught the lighter side of these questions, but a few were upset. However, nonengineers do notice these characteristics.

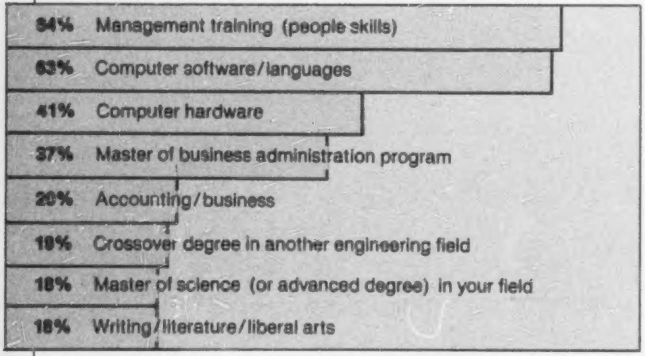
Figure 1 shows engineers' interest in additional education. Continuing education that can be of immediate benefit (computer training, management development) ranked the highest. Surprisingly, there was an equal amount of interest in pursuing a master of science degree as there was in getting a liberal arts, crossover bachelor of science, or accounting degree. The need for specialty programmers familiar with the papermaking process is increasing in the paper industry; thus, the software category received a high response. Most engineers are familiar with the difficulties of getting specialty software written for any sort of automated control system. Increasing use of small and portable computers in mills also makes computer programming for professionals an important skill.

Management training and a master of business administration degree are perennial favorites for people trying to escape the "engineering ghetto," as this survey showed. The strong interest in additional education is interesting considering that 95% of the respondents were trained engineers. Some topics added to the list included flying, music, professional engineer license, and psychology.

UNPROMOTABLE PROFESSIONALS. Many nontechnical people in the industry start at entry-level jobs and progress through a series of positions and titles. Many engineers feel left out of this process because they do not generally receive as many in-house promotions as nonengineers.

A technical professional, educated in a specialized discipline, may be highly competent in his or her field and yet be unpromotable in the eyes of management. With each step upward, the number of available positions decreases. Also, the available slots for promotion in technical areas are often for people managers and not for "superengineers."

FIGURE 1: **Subjects in which engineers would like additional education.**



This means that many talented professionals are stuck doing the job they were educated and trained to do. Promoting them, especially into management, would move them from an area in which they are productive to an area in which they may need extensive training. For those who may have studied engineering as a preparation for moving into management, this time spent "practicing" their profession can be very frustrating.

Technical professionals who feel stuck or at a dead end should ask themselves the following questions:

- Do I do my present technical/engineering job well? Am I qualified to do it by education, temperament, and training? Do I enjoy doing it in itself?

If you think you do your job well, put yourself in your company's shoes. Ask yourself why a competent, trained professional doing well in a department should be moved from that job to one in which previous training and education are only marginally helpful.

- Will the company be better off financially if I am moved or kept in this position?
- Is a company obligated to promote or move someone to enhance his or her career, even if it is detrimental to company interests?

Many engineers feel that professional experience is worth money to a company because it can save more than it costs. However, it is difficult to document such savings. An engineer could not easily prove that he or she has saved a firm money simply by having more years of experience than someone else.

Being a good professional engineer may require changing companies, moving into consulting, or realizing that the job you enjoy may have salary limitations. Moving into the more prestigious area of management sometimes means giving up your professional qualifications for a new set of values.

In most industries, a technical professional is trained to do a certain job and to do it well. Generally, other people in a company cannot do this person's job exactly and cannot easily be trained in-house to do it. Thus, companies will pay a premium for such professionals but will expect them to do their jobs for a considerable length of time before being promoted. The higher the starting salary, the longer the company's payback time.

Career paths work best when the company trains and educates the employee. But technical professionals are externally trained and normally hired as specialists. Thus, management tends to keep them in their areas of expertise as long as possible.

SALARY COMPRESSION. The following letter refers to an age-old problem in industries that pay fixed salaries. The problem, actually a dilemma, is commonly known as salary compression. Most engineers become victims of salary compression at some point early in their careers. It happens when entry-level salaries for new engineers are driven up by market conditions that do not directly affect salaries of current employees. Engineers with only a few years of experience are most likely to be caught in the salary compression syndrome.

> *In efforts to maintain and develop the best existing engineering talents, how can employers hire new graduates at or above existing salaries? Salary averages for new graduates are well published, and comparisons on a locality and company basis can easily be made. When an engineer with two to four years of experience witnesses this occurrence firsthand, the natural question to ask is why.*
>
> *— Professional engineer, midwestern mill*

Job experience is the heart and core of most salary complaints. A very persuasive argument made by many people is that experience improves them and makes them better qualified to do their job or even someone else's job. This feeling has been a part of U.S. business culture since the industrial revolution and is a major factor behind union demands that seniority be the basis for promotion. From a company's perspective, however, experience is often one of the least quantifiable employee attributes.

Studies by management consultants have shown that engineers do not begin to "pay off" for a company until two to three years after graduation. It takes that long for a new engineer to adjust to the job and then learn enough about it to make useful contributions. This means that engineers need three to four years of experience before a raise can be truly justified.

Since most paper industry professionals have annual salary reviews (except during the recent business downturn), raises during these years are determined by company policy (not necessarily an engineer's productivity) and may well be below the current market rate. From a management viewpoint, engineers with zero to four years of experience may have equal value. A new graduate, with top qualifications, management potential, and good timing in a hot job market, could well start with a better salary than an engineer with experience. Once an engineer has five or more years of experience, however, the opportunities for growth seem to open up.

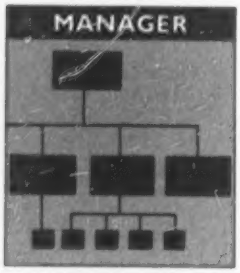
Like it or not, once a base salary is set, an engineer is usually stuck with it. Raises given will be a percentage of that amount until a real promotion is given. Salary erosion is compounded because companies usually don't make unilateral salary adjustments for existing employees to match changing market conditions. Internal promotions for the talented and the option of leaving for others provide a natural turnover of personnel.

"*A technical professional, educated in a specialized discipline, may be highly competent in his or her field and yet be unpromotable in the eyes of management.*"

FACING THE TRUTH. Engineers who are passed over for raises and promotions need to weigh the cost of changing jobs vs the cost of stagnation. Changing jobs with only two or three years of experience may not be a cure for salary limitations. Engineers with ten or more years of experience who have not moved into management express much less dissatisfaction with salary compression. Wage disparity between salaried and union scales is sometimes a problem, but it seems to have eased in recent years.

Engineers who seek management positions for the salary or prestige alone will find it tough going. The career choice for most engineers began before entering college. The years of education and training in technical matters will have to be put aside for other skills. People will have to become more important than facts if success as a manager is to be long lasting.

Success, promotions, and career advancements all come at a price. As a technical professional it is easy to lose sight of what is best for the individual. As one experienced engineer said, "I'd rather be a working engineer than a laid-off mill manager." ■



Pass Engineering Department: Take Extra Turn

ENGINEERS RISE TO THE CORPORATE LEVEL VIA PRODUCTION AND SALES

By MICHAEL J. DUCEY, Technical Editor

Survey of chief executives and vice presidents at paper companies traces career paths engineers have taken in higher education, work experience

■ How do engineers reach the corporate level? A recent *Pulp & Paper* survey of North American corporate officers found many former engineers among the top brass of pulp and paper companies. The survey was designed to identify the engineers who moved on to the corporate level by their engineering disciplines, technical and production experience, and the years it took to reach company headquarters. At the same time, and for general interest, the survey asked questions about compensation at the corporate level.

Figures 1 and 2 break down the executives by undergraduate disciplines, their graduate work (if any), and their previous primary job responsibility. Among the executives who were formerly engineers, the most popular undergraduate and graduate degrees were in chemical engineering (roughly 50% of bachelor of science respondents). A good portion of those degrees were from schools offering pulp and paper curricula as both a major and a minor.

The Institute of Paper Chemistry was found to be the leader among schools chosen by executives who studied technical disciplines after completing their undergraduate work. Physical science degree earners were also prevalent. The most popular major among these graduates was in forestry and forestry-related fields.

The survey found a wide variety of ages in the corporate office. For the most part, chief executives, chairmen, and presidents appear to have earned undergraduate degrees between the early 1940s and late 1950s, while most vice presidents seemed to have earned their undergraduate degrees in the 1950s.

The survey also showed that women have not reached executive status in pulp and paper companies. Reasons for this—aside from the relatively recent entry of women into the work force—include the age and slow movement of the paper industry as a whole. This will change. Women have entered pulp and paper undergraduate programs and gone on to become department heads and mill managers in great numbers during this decade.

EMPLOYMENT BACKGROUND. The executives surveyed held a myriad of job titles before filling their corporate roles. Among the chief executive officers, work experience seemed to be split fairly evenly between production and sales. These men were employed by their companies for a number of years before becoming the top executives.

Vice presidents moved up primarily from production supervisors, both as mill managers and divisional managers. They too have worked at their present company for at least ten years, but they have a more diversified employment record (particularly in production) in their company and in other companies. More than 90% have done most or all of their posteducation work inside the paper industry.

Discussions with a number of corporate officers disclosed a few similarities in the "climbs to the top." Technological developments seemed to push engineers into the limelight in their mill environment. For example, engineers are highly visible when a company moves competitively by increasing production. The invention of the twin-wire former helped many young engineers gain recognition.

The chemical engineer is of particular importance since many process enhancements must come from that discipline. Other facets of production such as instrumentation and process control, both evolving greatly in the current and in earlier decades, have helped elevate the engineer's career potential.

A few executives mentioned the importance of "people skills" and their good rapport with subordinates during their mill working days. Others mentioned their extra activities and awards, such as becoming a certified professional engineer or an officer in an industry-sponsored group. All these factors seem to be relevant criteria for front office selection.

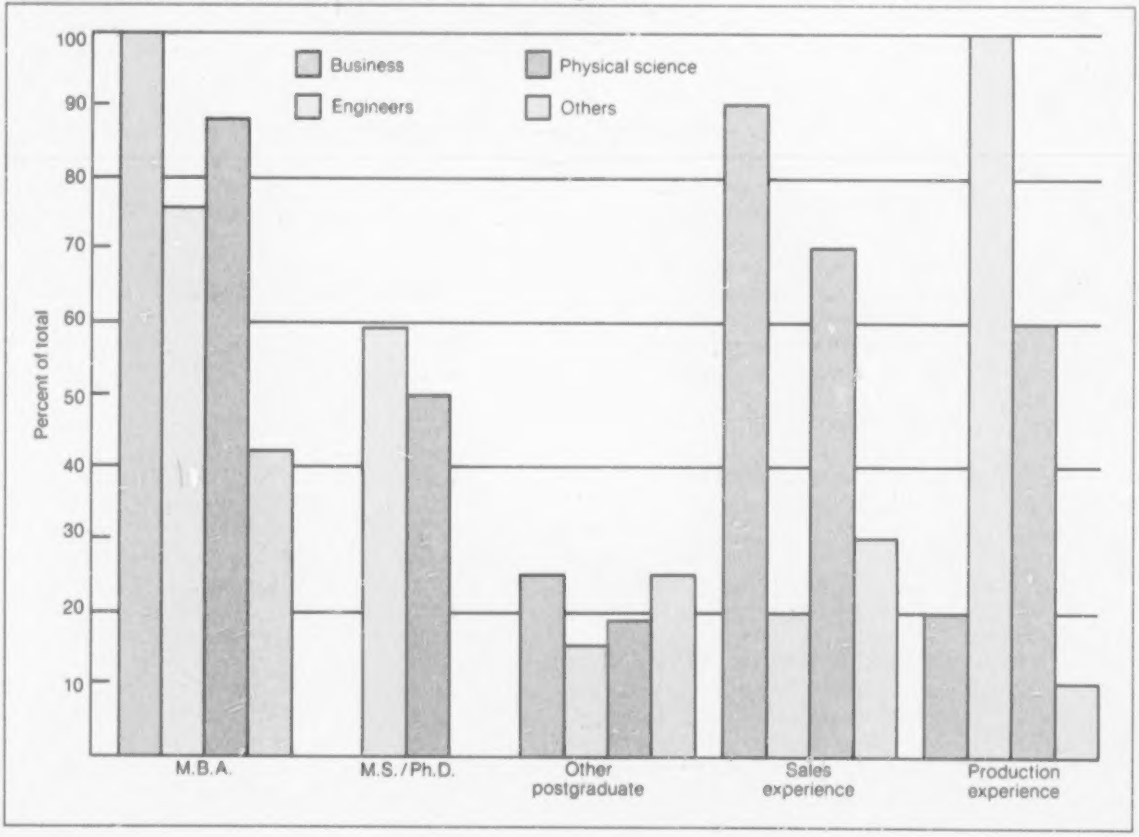
HEALTHY SALARY HIKES. Since the recession of 1981-82, salaries have increased steadily for all industry workers. Corporate officers have certainly enjoyed the bulk of these increases, as industry-sponsored surveys have revealed. Chief executives had a good year last year, having doubled their compensation in 1984. The average compensation last year for the top 20 chief executives in the pulp and paper industry was $881,000, a 50% increase over 1983.

Other corporate officers surveyed command salaries from $50,000 to over $100,000, depending upon position. Bonuses aside, the average annual increase over the last five years for these executives was around 12%. Each company has its own compensation system for upper management, and no clear way to break down these methods was sought.

THE FUTURE. First-year college entrants are enrolling in the sciences like never before. A tenth of all new enrollees plan to become engineers, while almost an equal amount seek computing degrees. Women are now the greater percentage of all higher education students, and they are gaining ground in the sciences as well. Schools are also invoking more cooperative education programs, realizing the need for practical training at the academic level.

TAPPI's Academic Relations Subcommittee recently disclosed survey results taken from 37 sustaining members which revealed that more than five engineers are hired for every scientist and nontechnical person hired.

FIGURE 1: **Chief executives' postgraduate study and work backgrounds.**



Among new professional staff members hired by these companies, a full 16% have come from the "paper schools." Table 1 breaks down the newly hired people during 1980 and 1984. The subcommittee also announced its efforts to have TAPPI gain acceptance into the Accreditation Board for Engineering & Technology in hopes of more clearly defining required curricula for a degree in the pulp and paper sciences.

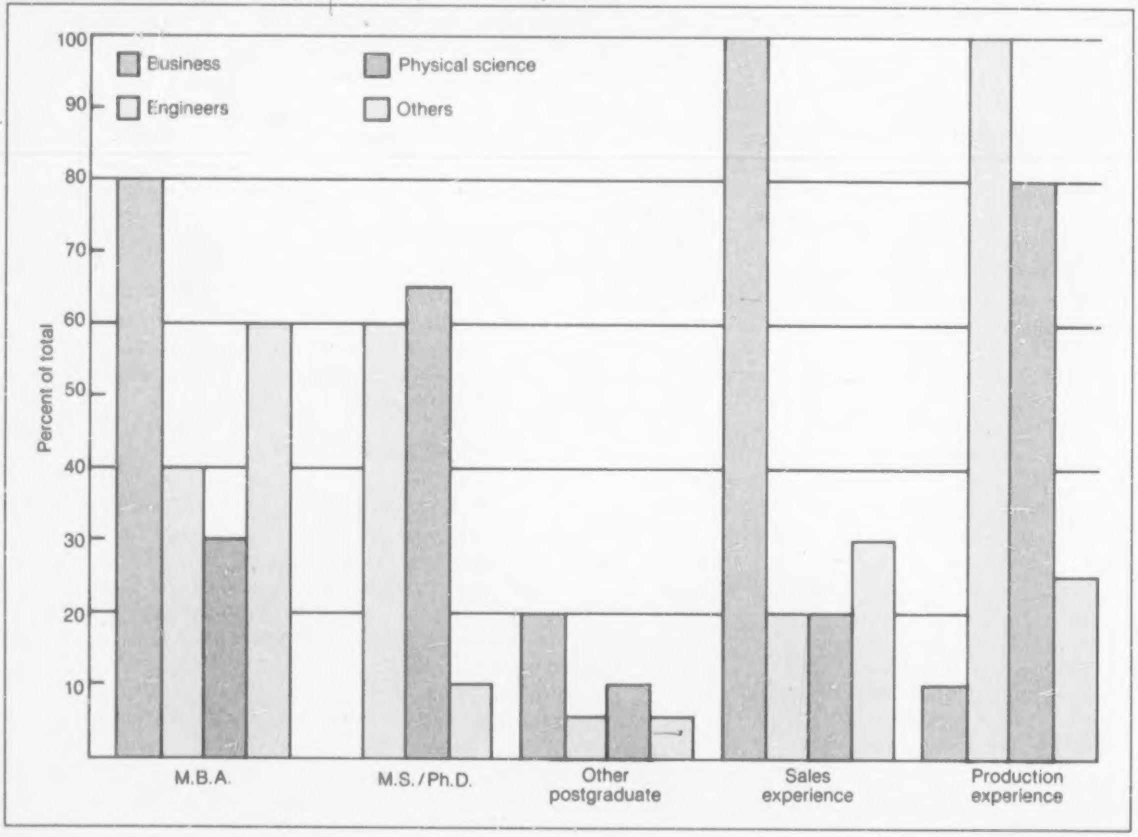
More than 100,000 new engineers and physical science students will graduate in 1985, the greatest number yet in the U.S. Of these, as many as 250 will hold degrees in the pulp and paper sciences, and approximately 85% of them will be employed after their first year out of school. About half of them will be hired by paper companies, and the remainder will serve in industry-related fields.

Of the talented engineers working today on the technology of tomorrow, many will find their way into a corporate position, primarily by moving into production or sales. Current officers enthusiastically claim that their employment record, strengthened and supported by their education and personal attributes, was the major force behind their movement to the corporate level. ■

TABLE 1: **New hires at 37 TAPPI sustaining member firms, 1980-84.**

	Engineers	Scientists	Non-technical	Total
All schools				
B.S.	410	74	75	559
M.S.	60	12	19	91
Ph.D.	15	34	—	49
Total	485	120	94	699
Paper schools				
B.S.	66	13	8	87
M.S.	12	9	3	24
Ph.D.	3	4	—	7
Total	81	26	11	118
Nonpaper schools				
B.S.	344	61	67	472
M.S.	48	3	16	67
Ph.D.	12	30	—	42
Total	404	94	83	581
Paper school hires (% of total)				
B.S.	16	18	11	16
M.S.	20	69	16	26
Ph.D.	20	12	—	14
Total	17	22	12	17

FIGURE 2: **Vice presidents' postgraduate study and work experience.**



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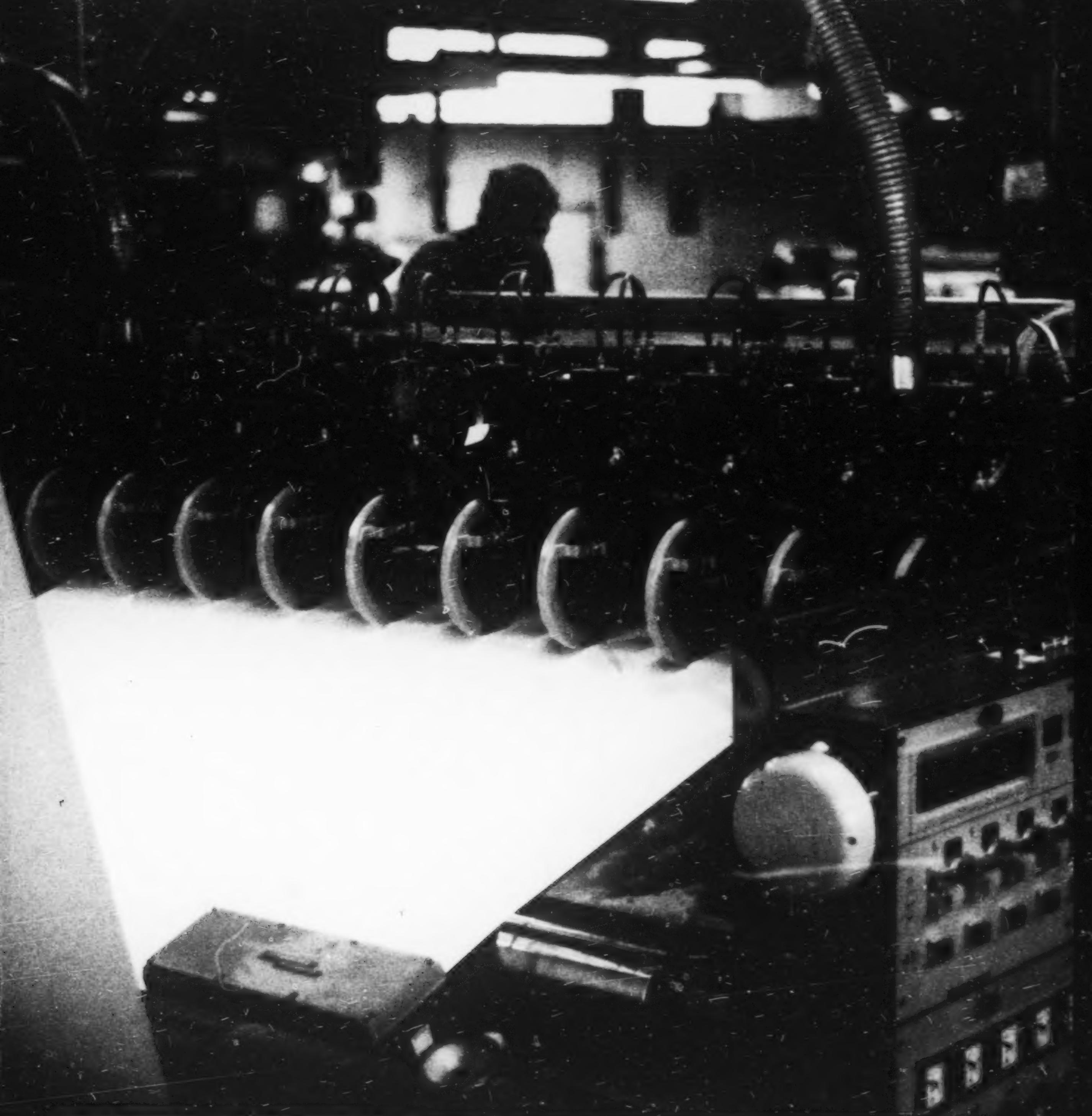

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Office locations

AT – Atlanta: 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339; (404) 432-3186

SF – San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273

NY – New York: 370 Lexington Ave., New York, N.Y. 10017; (212) 683-9294; Telex 220462

BR – Brussels: Chaussée de Charleroi 123a, Boite 5, B-1060, Brussels, Belgium; Telex 846-26872

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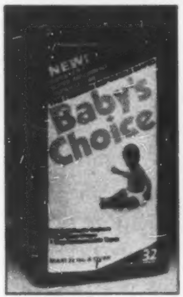

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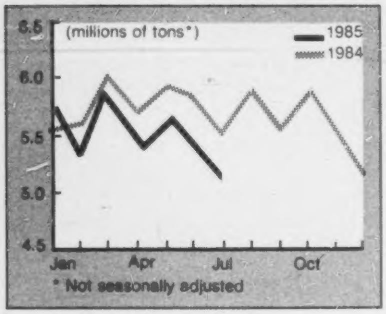
MONTH IN STATISTICS

U.S. paper and board production



* Not seasonally adjusted

U.S. production of paper and paperboard totaled 5.3 million tons in July, down 4.0% from July 1984, according to American Paper Institute figures. Paper production dropped 1.8% compared with last year, but most of the decline was in paperboard production, which dropped 6.1%. The seasonally adjusted annual rate through July stood at 66.5 million tpy, down 4.2% from the rate last July. The trend of production is up somewhat from the second-quarter rate of 65.5 million tpy, but still lags the first-quarter rate of 67.7 million tpy.

Among major grades, uncoated free sheet and tissue continued to be the only grades showing gains over last year, rising 3.2% and 1.3% through July, respectively. Uncoated groundwood, down 10.6% through the first seven months, and packaging papers, down 9.8%, were the biggest losers. Unbleached kraft paperboard was down 5.8% through July, with production for export off 23.4%. Adjusted for an extra day this July, corrugated box shipments were down 0.6% compared with July 1984.

Canadian newsprint shipments declined 4.1% in July to 728,000 tons, or 85% of capacity, the Canadian Pulp & Paper Assn. reported. July pulp operating rates were 87%. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	July	495	9.8	5,486	−1.6
Uncoated groundwood (s)	July	114	−10.2	1,440	−10.6
Coated paper (s)	July	455	−4.8	6,043	−2.8
Uncoated free sheet (s)	July	778	10.0	9,595	3.2
Other printing/writing	July	104	−8.8	1,342	−9.4
Total packaging and other paper (s)	July	414	−14.5	5,188	−9.8
Tissue	July	390	−2.7	4,898	1.3
Total paper	**July**	**2,713**	**−1.8**	**33,992**	**−2.0**
Unbleached kraft paperboard	July	1,312	−5.9	16,347	−5.8
Semichemical medium	July	412	−5.5	5,007	−3.8
Bleached paperboard	July	314	−8.7	3,947	−3.8
Recycled paperboard	July	573	−5.4	7,619	−3.1
Total paperboard	**July**	**2,611**	**−6.1**	**32,920**	**−4.6**
Total U.S. paper and paperboard output	**July**	**5,324**	**−4.0**	**66,911**	**−3.3**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	June	4,442	−5.3	54,331	−3.1
Market pulp production	June	568	2.5	6,900	1.3
Wastepaper consumption at paper/board mills	June	1,268	−2.0	15,259	−5.5
Pulpwood consumption (cords)	June	6,943	−4.4	86,416	−2.2
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft^2)	July	22.025	3.2	155.438[6]	16.5
Containerboard inventories at U.S. box plants and mills	July 1	2,838	−2.9		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	June	887	−7.9	11,160	8.6
Imports of Canadian newsprint	June	667	−6.8	8,204	9.8
U.S. paper exports (including products)	June	369	−11.9	4,000	−10.7
Exports of unbleached kraft linerboard	July	153	−13.1	1,693	−23.4
Exports of woodpulp	June	372	21.2	3,862	4.8
Norscan pulp inventories[4]	July 31	1,513	4.4		
Norscan pulp operating rates[4]	July	84%	91%	79%	86%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	July	728	−4.1	5,214[6]	.2
Operating rates	July	85%	98%	92%	92%
Inventories held by U.S. consumers	July 31	1,505	.6		
Other paper/board shipments	July	244	10.4	1,739	9.1
Woodpulp shipments (export only)	July	611	5.5	4,039[6]	7.9
Operating rates	July	87%	95%	88%	84%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = shipments.

PAPER-GRADE CHEMICAL MARKET PULP: Too much production as new mills come onstream

Grade structure: Paper-grade chemical market pulp is sold in the open market and does not include captive pulp used onsite or shipped to affiliated mills within North America. Pulp is divided into grades based on whether it is made from softwood or hardwood fiber, whether it is produced by the sulfate (kraft) or sulfite pulping process, and whether it is bleached, semibleached or unbleached.

Northern bleached softwood kraft (NBSK) is the premium pulp grade because of its long fiber length and strength, although papermakers have been making more use of southern pine and hardwoods. Market pulp is sold in sheets, flash-dried bales, or rolls. U.S. paper pulp statistics include more than than 1 million tons of fluff pulp used in diapers.

Production/capacity: Canadian production of chemical paper-grade market pulp declined slightly to just below 6.0 million metric tons in 1984 due to the impact of the ten-week British Columbian labor dispute. U.S. output jumped 9% to a record 5.2 million tons, reflecting the supply gap created by the British Columbian industry shutdown plus startup of new capacity in the U.S. South.

Canadian pulp output in 1985 is expected to be slightly higher than a year ago, while U.S. production is expected to be essentially flat. Operating rates in Canada and the U.S. this year are expected to average only about 88%.

North American and Scandinavian producer inventories dropped from a recent peak of about 1.8 million metric tons in February to about 1.5 million tons at the end of July as the result of heavy downtime. Further curtailments will be needed because of current world oversupply caused by the recent startup of a large number of new mills.

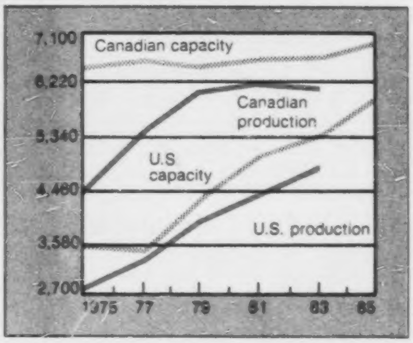
Pricing: Pulp prices began to bottom out this spring as heavy downtime reduced inventory levels. From a peak of $540/ton during the British Columbian labor dispute last spring, the U.S. list price for NBSK tumbled to $425/ton by late summer. This is about the same as price levels in Europe—translated from local currencies in which most sales are now taking place. Hardwood pulp prices have been even weaker, especially in Europe where nontraditional producers (Portugal, Brazil, South Africa, etc.) now have an important influence.

Current world price levels are unprofitable for many North American mills. Even with the recent weakening of the U.S. dollar, U.S. and Canadian mills are still at a cost disadvantage with producers in Scandinavia and nontraditional producing countries.

Unfortunately, the new capacity coming onstream will make any increase in pulp prices difficult before 1986—at the earliest. The outlook beyond 1986, however, looks brighter because of a lack of major new expansions before the early 1990s and forward integration of some U.S. market pulp capacity into white paper production.

Year-end U.S. market pulp prices in $/metric ton for NBSK: 1976, $410; 1977, $342; 1978, $375; 1979, $460; 1980, $530; 1981, $530/$565; 1982, $440; 1983, $450; 1984, $510; 1985 (mid-year), $425.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 metric tons)*

	1983	1984	1985e
United States			
Production	4,723	5,153	5,150
Capacity	5,335	5,489	5,876
Utilization rate	88.5%	93.9%	87.6%
Imports	2,448	2,679	2,500
Exports	2,470	2,559	2,635
Apparent U.S. consumption	4,701	5,273	5,015
Canada			
Production	6,083	5,975	6,100
Capacity	6,840	6,885	6,917
Utilization rate	86.6%	86.8%	88.2%

e = Estimate.

TOP PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Weyerhaeuser$^{1.2.3.5.6}$	900	7.0
2. Georgia-Pacific$^{1.2.5}$	700	5.5
3. International Paper$^{1.2.6*}$	630	4.9
4. P & W$^{1.2}$	580	4.5
5. GLFP$^{1.2.3}$	575	4.5
6. Westar Timber$^{1.3}$	570	4.5
7. Canadian For. Prod.$^{1.3.4}$	565	4.4
8. B.C. Forest Products$^{1.3.4}$	480	3.8
9. MacMillan Bloedel$^{1.3.4}$	460	3.6
10. GN Nekoosa$^{1.2.3}$	410	3.2

Market share of top five companies: **26.4%**

Market share of top ten companies: **45.3%**

North American capacity (1985):
12.793 million metric tons

Note: Several companies with major holdings in the market pulp sector are not shown above to avoid double counting of capacity: Noranda, 610,000 tpy (49% of MB, 50% of Northwood, 100% of Maclaren, 100% of Fraser); Canadian Pacific 600,000 (54% of Great Lakes, 100% of CIP); and Mead 480,000 tpy (50% of Northwood, 50% of Brunswick, and 28% of BCFP).

* Exact capacity is difficult to estimate because some of the company's mills also make dissolving pulp.

1. Bleached softwood kraft. 2. Hardwood kraft.
3. Semibleached softwood kraft. 4. Unbleached kraft.
5. Bleached hardwood kraft. 6. Fluff pulp.

- UPIU workers settled with **Stone Container Corp.** at its 1,145-tpd kraft board and linerboard mill in Hopewell, Va. The new three-year contract, effective July 31, calls for a ratification bonus of $1,100 in the first year and general wage increases of 3% in each of the remaining two years, expiring July 31, 1988.
- UPIU workers at **French Paper Co.**'s 60-tpd fine papers mill in Niles, Mich., ratified a new two-year contract, effective Aug. 22. The new agreement calls for pay hikes of 4% each year and expires Aug. 22, 1987.
- UPIU members continue to strike at **Georgia-Pacific Corp.**'s 1,500-tpd bleached paper, tissue, and paperboard mill in Crossett, Ark. Since the 1,100 workers began striking on June 19, the mill has operated with salaried employees. No meetings have been held and none are scheduled.
- **Newton Falls Paper Mill Inc.** has settled with UPIU workers at the 400-tpd fine printing and publication papers facility in Newton Falls, N.Y. The new three-year contract calls for pay hikes of 2% on Aug. 15 and 2% Feb. 15, 1986 for the first year; 2% on Aug. 15, 1986 and 3% on Feb. 15, 1987 of the second year; and a 4% general wage increase on Aug. 15, 1988, when the three-year contract expires. ■

Five-year pact ends lockout at Simpson mill

Members of the Assn. of Western Pulp & Paper Workers at Simpson Paper Co.'s 640-tpd Fairhaven, Calif., bleached kraft pulp mill returned to work after ratifying a new five-year labor contract, ending a lockout that began on May 20 (*P&P*, July, p. 39). The mill was idle throughout the work stoppage.

The new agreement follows the West Coast wage increase pattern of $1,000/4%/4.5% in the first three years, with the final two years' wage increases to be based on an average of settlements in 1987 and 1988. The contract expires July 1, 1989.

- **St. Joe Paper Co.** has settled with UPIU members at its 1,300-tpd linerboard mill in Port St. Joe, Fla. Effective July 29, the three-year contract calls for pay hikes of 3%/3%/3%, expiring July 31, 1988. ■

SALES/EARNINGS

Sales up, profits down for Canadian industry

The strength of the U.S. dollar continued to help earnings of Canadian pulp and paper companies during the second quarter. But this was more than offset by further deterioration in market pulp prices and the heavy downtime which caused two major producers to report losses for the second quarter.

Newsprint and groundwood paper markets remained fairly satisfactory for most producers. Lumber prices began to show some improvement late in the quarter. Nevertheless, the ten companies included in the accompanying table reported a 16.4% decline in profits on a 9.3% increase in sales. Also, after-tax profit margins averaged only about 2.4% of sales.

Newsprint held up. Consolidated-Bathurst Inc. reported a 63.5% increase in its second-quarter earnings (excluding a C$10.9-million extraordinary credit in the 1984 quarter, which resulted in a slight decline in net income). Con-Bath attributed the increased earnings to better pound-sterling and U.S. dollar exchange rates, higher productivity at its newsprint mill in the U.K., and improvements in both the newsprint and groundwood specialties markets (partially offset by sharply lower margins in bleached pulp).

Abitibi-Price Inc. reported a 7.4% slip in earnings and noted that newsprint shipments declined slightly in the second quarter from the first three months of 1985. Most of the Abitibi newsprint mills took downtime, but the two groundwood paper mills operated nearly at capacity. Abitibi expects newsprint and groundwood paper sales to continue at about the present level for the rest of 1985.

Domtar managed to produce earnings of C$18.7 million, despite a strike at its Quevillon, Que., market pulp mill (settled during the second quarter) and reduced profits from fine papers. These difficulties more than offset improved results in the newsprint market. Another firm benefiting from the improved newsprint and coated publication paper markets was British Columbia Forest Products Ltd., which reported a 20.3% increase in profits.

Red ink from market pulp. The sharp slide in market pulp prices took its toll on heavy producers in both eastern and western Canada. Great Lakes Forest Products Ltd., one of the most efficient producers, reported a loss of C$1.7 million for the second quarter, which it also blamed on lower prices for fine papers and lumber.

In western Canada, Canfor Corp., a major market pulp and lumber producer, posted a loss of $12.1 million

Canadian paper industry second-quarter results.

Companies	Sales	Change 1985/84	Earnings[1]	Change 1985/84
Abitibi-Price	C$662,354	12.9%	C$21,307	−7.4%
British Columbia Forest Products	290,100	10.4	7,100	20.3
Canfor Corp.	307,400	13.1	(12,100)*	n.m.
Cascades Inc.	68,600	39.4	4,000*	n.m.
Consolidated-Bathurst	445,100	1.4	24,200	63.5*
Domtar	527,500	1.0	18,700*	−15.0*
Donohue	105,600	−11.2	4,200	−52.3
Great Lakes Forest Products	146,819	−6.5	(1,657)	n.m.
MacMillan Bloedel	598,000	11.9	7,800	−17.0
Rolland	76,200	8.1	1,225*	−48.3
Scott Paper	63,338	20.4	2,664	25.4
Total	**C$3,291,011**	**9.3%**	**C$77,439**	**−16.4%**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.

***Abitibi-Price:** excludes 1984 extraordinary loss of $2,350,000; **Canfor:** excludes 1985 extraordinary gain of $3,500,000; **Cascades:** excludes 1985 special gain of $4,600,000; **Consolidated-Bathurst:** excludes 1984 special gain of $10,900,000; **Domtar:** excludes special gains of $1,300,000 in 1985 and $1,500,000 in 1984; **Rolland:** excludes 1985 credit of $935,000.

( ) = Loss. n.m. = Not meaningful.

tion of the dollar, slower growth in Europe relative to the U.S., and little improvement in access to such markets as Japan, according to Irene W. Meister, API vice president-international. U.S. real GNP surged 6.8% in 1984 compared with between 2% and 3% growth for the majority of European economies.

In 1984, U.S. exports of pulp, paper, paperboard, wastepaper, and converted products increased by 3% to 11.3 million short tons. Without the inclusion of wastepaper export tonnage—which jumped 25.7% to 3.3 million tons in 1984—U.S. paper industry exports decreased 3% to 8.1 million tons.

Import influx. Meanwhile, imports jumped 18.8% to a record 15.7 million tons. In addition to the increased imports of market pulp and newsprint that the U.S. has traditionally imported from Canada, "a sharp influx of printing and writing papers, which have not traditionally been a major import item" occurred, according to Dr. Meister. These imports reached about 2 million tons, almost double the 1983 level, according to "Exports of Pulp, Paper, Paperboard and Converted Products to World Markets—1984."

Total U.S. paper industry exports to western Europe fell 3.6% to 2.86 million tons, with pulp exports dropping 6.7%. Paper and board exports were 5.6% lower than in 1983. In the same period, total Swedish and Finnish exports of paper and board increased 10.3% and 13.6%, respectively, with a large proportion of the tonnage destined for the western European market.

In contrast to European activity, the Japanese economy achieved a 5.8% growth rate in 1984, fueled by strong export demand. Paper and paperboard consumption reached a record level of 21.1 million tons but was satisfied for the most part through a 4.9% growth in domestic capacity rather than through imports, which increased 1.9%. Total U.S. paper industry exports to Japan increased 3.1%, reaching 1.6 million tons, but all of the growth was concentrated in higher sales of woodpulp (up 2.8%) and wastepaper (up 15.9%). U.S. exports of paper and paperboard fell by almost 3%.

Latin America's slight recovery. Latin America showed some slight growth in demand in 1984, although inflation, high unemployment, and heavy foreign debt continued to dampen overall demand, as did U.S. paper industry exports to the region. Total U.S. exports were slightly over 2 million tons, 4.5% higher than in 1983 but still below the prerecession high of 2.6 million tons exported in 1980.

U.S. exports to Mexico, the region's most important market, have been particularly hard hit by the country's debt problems. Mexico imposed strict control on most imports and embarked on a policy of self-sufficiency and import substitution. U.S. exports of paper, paperboard, and converted products last year were 206,000 tons, only half their 1983 level. Exports of pulp and wastepaper, however, increased from 532,000 to 717,000 tons over the same period. ■

RESEARCH & DEVELOPMENT

Spending for R&D soars, but paper lags behind

U.S. business last year boosted research and development by a surprising 14% from 1983—the biggest gain in outlays since the late 1970s, according to a recent *Business Week* survey of 820 companies. The survey included all publicly held companies with sales of at least $35 million and R&D outlays of at least $1 million, or 1% of sales.

While U.S. industry spent 2.9% of sales on R&D in 1984, up from 2% in 1983 (representing a real gain of 10% after adjusting for inflation), the paper industry devoted just 1% of sales to research—the same percentage as in 1983. On the bright side, the $314 million spent by paper companies on R&D last year represents a 7% increase over 1983 expenditures, besting earlier estimates of a 5.2% increase.

The estimates for the paper industry were based on a sample of about a dozen companies. Earlier this year, Battelle Memorial Institute's Columbus Div. estimated R&D for the entire paper industry at $596 million. ■

R&D expenditure data for the paper industry, 1984.

	Millions of dollars	Percent change from 1983	Percent of sales	R&D dollars per employee
Badger Paper Mills	0.6	7	1.2	1,421.7
Boise Cascade	7.9	31	0.2	285.7
Crown Zellerbach	15.3	5	0.5	802.1
Fort Howard Paper	6.9	106	0.5	499.5
Hammermill Paper	7.6	29	0.4	584.6
James River Corp.	23.3	27	1.0	1,109.5
Kimberly-Clark	76.8	45	2.1	2,176.6
Mead	22.0	−55	0.8	1,294.1
Scott Paper	39.8	6	1.4	1,930.0
Union Camp	32.7	23	1.7	1,846.5
Westvaco	23.2	16	1.3	1,550.3
Weyerhaeuser	45.6	−3	0.8	1,207.4
Total	**314.0**	**7**	**1.0**	**1,261.0**

Source: *Business Week* (from 10-K statements).

SAFETY

Gas leak at Champion mill will be prevented in future

A chlorine gas leak at Champion International Corp.'s Canton, N.C., mill on the morning of Aug. 19 injured 22 people. The accident occurred when the air control valve on a tank used to mix water and chlorine was inadvertently turned off, releasing chlorine gas into the air.

Of the 22 people injured from gas inhalation, only five were Champion employees; the others were construction contractors working nearby. Four of those injured were put in intensive care, but all were released from the hospital within 48 hours.

To prevent a recurrence of the accident, the valve handle on the mixing tank now requires a special tool to turn off the valve. ■

WORLD CAPACITY

World paper/board capacity expected to grow only 1.4%/year during 1984-89

World capacity for paper-grade woodpulp production will rise only 1.1%/year over the 1984-89 period, while paper and paperboard capacity will increase only 1.4%, according to the latest survey conducted by the United Nation's Food & Agriculture Organization (FAO). This compares with a 2.0% growth rate for paper and paperboard capacity in the 1979-84 period, and 2.8% from 1974-79. Pulp capacity growth rates over the same periods averaged 1.5% and 2.1%, respectively.

By 1989, world capacity for paper-grade woodpulp is expected to rise by 8.4 million metric tons to a total of 155.9 metric million tons. Capacity for paper and paperboard production would increase by 14.8 million tons, to 227.3 million tons in 1989. Last year, capacity for paper-grade woodpulp was estimated at 147.5 million tons. Capacity for paper and paperboard totaled 212.5 million tons. This represented about a 2.4% increase in woodpulp and a 3% jump in paper and paperboard capacity compared with 1983, according to the FAO's *Pulp & Paper Capacities 1984-1989.*

TABLE 1: **World woodpulp capacity, 1984-89.**

	Capacity (000 metric tons)		**Annual average increase (%)**	
	1984	**1989**	**1979-84**	**1984-89**
Developed economies	121,072	127,584	1.2	1.1
North America	73,954	77,287	1.7	0.9
Japan	12,066	12,611	−0.5	0.9
Western Europe	31,399	33,275	0.4	1.2
Oceania	2,630	2,798	3.8	1.2
Others	1,023	1,613	7.2	9.5
Developing economies	8,736	10,543	6.0	3.8
Africa	777	818	15.6	1.0
Latin America	5,962	7,342	3.9	4.3
Asia	1,997	2,383	10.6	3.6
Centrally planned economies	17,644	17,799	1.5	0.2
Asia	1,202	1,282	−14.0	1.3
Eastern Europe	4,392	4,467	3.1	0.3
U.S.S.R.	12,050	12,050	3.7	—
World total	**147,452**	**155,926**	**1.5**	**1.1**

Source: FAO Pulp & Paper Capacities, 1984-1989.

TABLE 2: **World paper and paperboard capacity, 1984-89.**

	Capacity (000 metric tons)		**Annual average increase (%)**	
	1984	**1989**	**1979-84**	**1984-89**
Developed economies	165,729	176,746	1.9	1.3
North America	82,835	87,224	1.9	1.0
Japan	23.495	25,565	1.8	1.7
Western Europe	54,729	58,506	1.7	1.3
Oceania	2,894	3,177	4.7	1.9
Others	1,776	2,274	7.2	5.1
Developing economies	20,151	23,371	6.0	3.0
Africa	1,020	1,145	7.2	2.3
Latin America	11,183	12,991	5.4	3.0
Asia	7,948	9,235	6.9	3.0
Centrally planned economies	26,587	27,224	0.1	0.5
Asia	6,040	6,284	−7.6	0.8
Eastern Europe	6,547	6,940	1.8	1.2
U.S.S.R.	14,000	14,000	4.0	—
World total	**212,467**	**227,341**	**2.0**	**1.4**

Source: FAO Pulp & Paper Capacities, 1984–1989.

The fastest growth in paper and paperboard capacity over the next five years is expected to be in the developing market economies of Asia, Africa, and Latin America with a growth rate of 3.0%/year, although this is only half the rate for the preceding five years. This compares with a rate of 1.3% for developed market economies and 0.5% for the centrally planned economies over the 1984-89 period (Table 2). The developed countries will still account for 77.7% of total paper and paperboard capacity in 1989, although the developing nations will have increased their share from 7.8% in 1979 to 9.5% in 1984 and 10.3% in 1985.

Paper grades. Capacity for major grades of paper and board in 1984 increased at a slightly faster pace than was predicted a year ago, although the rate of increase over the next five years is expected to be lower, according to the FAO.

Newsprint capacity is projected to rise from 31.2 million tons in 1984 to 33.3 million tons in 1989. This would result in an average rate of capacity expansion of 1.3%, down from 2.8% for the preceding five years. About 40% of the projected 2.1-million-ton increase in world newsprint capacity is in the developing countries. Newsprint capacity will rise by only 1.3%/year in the developed nations, with only a 0.9% rate of increase in North America.

Printing and writing paper capacity will rise from 54.8 million tons in 1984 to 61.7 million tons in 1989. This 6.8-million ton gain amounts to a 2.4% annual rate of expansion over the next five years, down from 4.1% for the 1979-84 period. Printing/writing paper capacity jumped by 3.5 million tons in 1984, an unexpectedly high rate of increase caused mainly by the addition of nearly 1 million more tons of capacity in the U.S. than had been predicted in the last survey.

Capacity for other paper and paperboard grades is expected to grow from 126.4 million tons in 1984 to 132.3 million tons in 1989. This nearly 6-million-ton increase amounts to

CHEMICALS

Chemicals help to improve quality and efficiency in U.S. paper mills

Pulp & Paper's annual survey looks at chemical developments by process; consumption and price of most chemicals appear stable in 1985

By MICHAEL J. DUCEY, Technical Editor

■ Paper production has leveled off this year, and growth has been limited to a few grades. The upward trend of white and coated sheets continues, while linerboard and newsprint grades head downward. Prices of all grades, especially market pulp, have been depressed, due primarily to the strong U.S. dollar. Imports of tissue, coated paper, bristols, and some paperboard have increased sharply; exports of these grades have declined.

Recycled grades, corrugated, and uncoated groundwood are the only bright spots for U.S. producers on the world market. Production in general has followed yearly cyclical trends but on a lower level than last year. Fourth-quarter production may dip even further, rounding out a 4% drop in total production from 1984.

Chemical use closely coincides with those production trends, particularly the chemicals used in larger volumes, such as the chloralkalies, clay, and starch, according to a survey recently conducted by *Pulp & Paper*. Chemical industry sources have complained all year about the pressure put on prices by paper manufacturers, and many have succumbed to modest discounting of several items. List prices seemed meaningless compared with the previous year.

Supply has exceeded demand for all chemicals, but the future promises change. Tight markets in caustic, titanium dioxide, and sulfur are predicted for the late 1980s. Oversupply could be common for sodium chlorate, kaolin, calcium carbonate, and hydrogen peroxide. Again, industry health as a whole should be noted—its historical correlation with the U.S.'s GNP can serve as a handy forecaster.

The chemical industry is too widespread to permit trends to be distinguished. If 1984's prices (when paper prices rose 7.2% and industrial chemicals dropped 0.4%) are any indication, no generalization about future prices can be made. Incremental price increases can be expected, except for those chemicals in oversupply.

Chemicals for power generation were not included in the survey. Conversions to coal, multifuels, and cogeneration are having a positive impact on operating costs. This should continue into the next decade unless government regulations are inhibiting.

Pulp & Paper's survey has changed from previous years to include a wider range of chemicals, comments, and graphic aids. *Pulp & Paper* invites your input on this new format. Please address all comments to the author.

PULPING. Commercial implementation of technological developments in U.S. pulping operations has been slow. Basic sulfate, sulfite, and mechanical pulping methods have not varied much during the 1980s.

Mechanical pulping developments have historically been the domain of equipment manufacturers. As more quality improvements are realized with chemical pretreatment, however, companies may be more willing to add chemicals to mechanical processes. Among the chemicals used to pretreat chips in, or after, the refiners are saltcake, caustic, and soda ash. Whether or not these chemicals will speed conversion of systems remains to be seen, but the presence of less-than-perfect wood resources also encourages conversion.

Sulfite pulping was the choice in the most recent con-

FIGURE 1: **Consumption of pulping chemicals by U.S. pulp mills.**

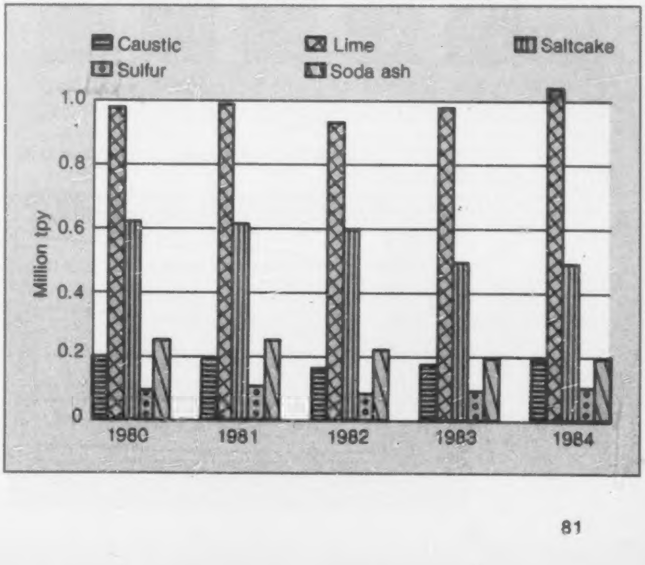


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FIGURE 2: **Price history of pulping chemicals used in the U.S.**

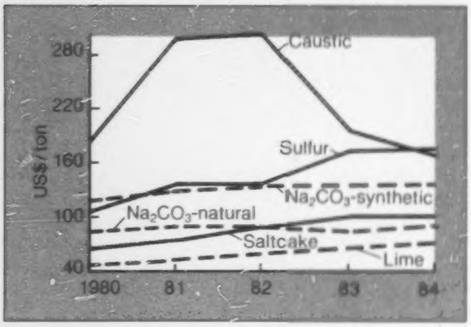


FIGURE 3: **Consumption of bleaching agents in U.S. chemical pulp mills.**

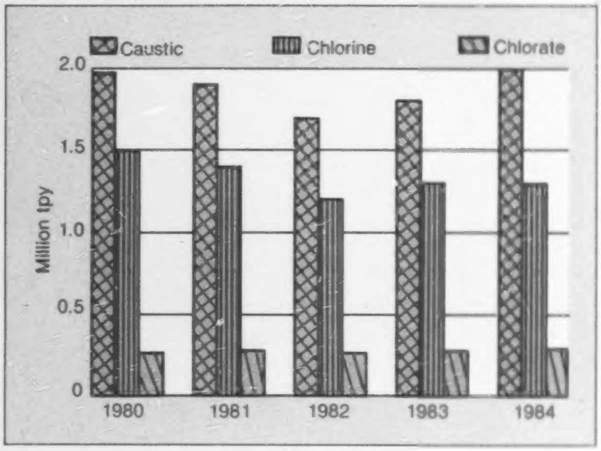


FIGURE 4: **Consumption of bleaching agents in U.S. mechanical pulp mills.**

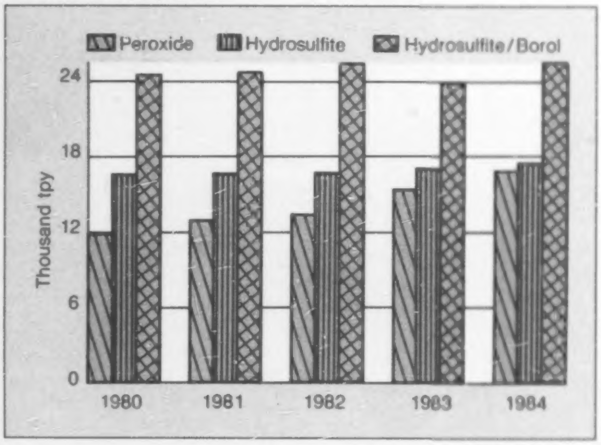
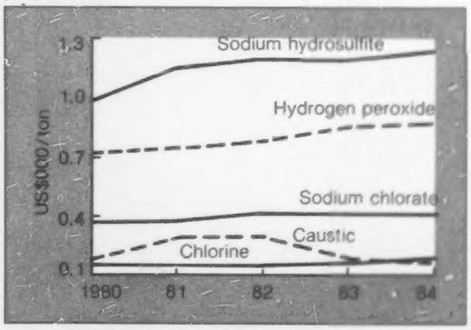


FIGURE 5: **Price history of bleaching agents in U.S. pulp mills.**



tinuous digester startup, which occurred at Crown Zellerbach Corp.'s mill in Camas, Wash. But the future for the process is still hazy for environmental and economic reasons. The Camas digester is using a magnesium bisulfite process because of operating ease and finished product quality. Other bases for sulfite include ammonia, sodium, and calcium. The last two are in decline due to uneconomical recovery and sewering restraints.

The major chemical used in the process is sulfur, which is converted to sulfur dioxide before inletting to the reactor. Caustic is used to provide the sodium requirement. The world sulfur market is currently experiencing firmer prices and tighter supply. The sulfur market is dependent on the fertilizer, oil, and natural gas industries, none of which could be labeled "stable." Frasch sulfur is now mined in only three locations in the U.S., and declining petroleum production is depressing the supply of recovered sulfur.

New sulfur may be coming out of the U.S.S.R., as that country plans to open and operate a sour gas depository on the Black Sea next year. This natural gas facility could dump 3 million tons of sulfur on the world market in its first year of operation. Several sulfite operations also use saltcake, soda ash (in liquor preparation), and other sodium- and sulfur-based chemicals. Mills with modified sulfite cooks are stressing reduced chemical charges, such as in high-yield processes.

The kraft process has not changed much over the past decade, although more attention is being given to enhancement additives and modified cooks. The chief chemicals—caustic and sodium sulfide—are now being teamed with anthraquinone to increase yields and improve quality. Widespread use of anthraquinone is curtailed by its high purchase price ($2 to $3/lb) and licensing fee (20¢/lb used). Typical additions are 2 to 4 lb/ton.

The most exciting development in kraft systems is in the area of chemical makeup, namely soda ash and saltcake. Saltcake prices have suffered this year simply because more mills are using caustic and emulsified sulfur as sodium/sulfur replacements. Prices for these two chemicals have also been low. Saltcake problems have been compounded by more efficient use of spent acid from chlorine dioxide generators and the fact that waste stream excess sulfur resulting from the use of sodium sulfate in the kraft cook cannot be reused.

The other interesting facet of kraft makeup is conversion of caustic to soda ash as the sodium base. Soda ash demand has been declining along with sulfite pulping, but new life in kraft systems is predicted for the future. Like saltcake forecasts, this depends on the price of caustic, and experts agree it may be more site specific. Consulting Resources Inc. sees conversions triggered by a 30% increase in the price of caustic, which would also strengthen saltcake consumption.

The recovery cycle of kraft mills employs calcium oxide to regenerate caustic from waste sodium carbonate solution. The lime itself is 95% recovered in the cycle. Consumption rates are closely related to production, and price and supply can be categorized as stable.

BLEACHING. The bleaching stage is the major consumer of chemicals in pulping. Demand for white pulp is high as communication papers command a larger market. This is a two-edged sword: increases in chemical addition can be offset by more efficient use of existing chemicals, reducing overall consumption.

Mechanical pulp bleaching appears to be a focal point of the chemical industry's concentration in pulp processing. The two principal methods, oxidative and reductive, are being explored both singularly and in tandem. Dithionite or sodium hydrosulfite bleaching, a reductive method, is the most common method in use today. Most mills use a single vessel to add diluted hydrosulfite to the pulp along with a sequestering agent. Another method employs sodium borohydride, caustic, and sulfur dioxide in a rapid mix with the pulp. These two bleaching formulas can also be used at, or between, refiner stages.

Industry sources suggest that borol and hydrosulfite have an equal share of reductive bleaching in the U.S. Oxidative bleaching formulas involve peroxide (hydrogen or sodium) and, to a lesser extent, hypochlorite. Some form of alkali is added for pH control, and silicates, Epsom salt, and sequestering agents are mixed in for pulp protection and buffering. Peroxide bleaching is usually carried out in a single-tower configuration or in a disk refiner stage. Two-stage mechanical pulp bleaching can have oxidative or reductive action in either order, depending on the incoming pulp and the brightness level of the desired product.

The supply of major chemicals is provided by a handful of companies. Dithionite is produced by Olin Corp. and Virginia Chemicals, the latter selling a special mix called "Z-Brite." The Ventron Div. of Morton Thiokol is still the sole supplier of borol solutions. Peroxide is manufactured by DuPont, FMC, and Interox, the last two having expanded by an additional 25,000 tons in 1985. Demand for peroxide in mechanical pulping processes is expected to climb 40% over the next five years. This has prompted the Degussa Corp. of Fed. Rep. Germany to announce the construction of a new $60-million facility in Mobile, Ala. This 36,000-tpy plant should be completed by 1987 and will incorporate the company's new bleaching concepts for both mechanical and chemical pulps in a process that uses peroxide as the primary additive.

Forecasts for chemical pulp do not show rapid, positive growth after Champion International Corp. opens its new hardwood pulping facility in Quinnesec, Mich., next year. Rumors have been circulating in the South and Southeast about a chemical pulp mill expansion, but none have been formally announced.

Bleach plants continue to improve their systems with installations of mixing equipment, automatic control, and new chemical charges. These plants have undergone extensive examination and modification for the last decade to improve efficiency and product quality and ease effluent loads.

Chemicals are a big part of this effort. The major additives—chloralkalies—are a focal point for reduction. Chlorine dioxide substitution in chlorination, oxygen addition at the caustic extraction stage, and oxygen delignification are all contributing to reducing the consumption of chlorine and sodium hydroxide. Producers of these two chemicals—20% of the market in pulp bleaching—have been frustrated by fluctuating prices. Many price increases over the year have been met with stiff resistance. Plant closures, low operating rates (less than 80% in 1985), and discounting have been the reality. One new plant has been announced for 1987 startup. Olin and DuPont will jointly operate a plant in Niagara Falls, N.Y., to produce 660 tpd of chloralkali product.

The immediate future is not much brighter for sodium chlorate producers, the chief chemical used to produce chlorine dioxide. Supply is exceeding demand, and this trend will continue throughout the decade. Discounting (as great as 20%) has become a major draw on profits as producers depress prices, citing pulp price doldrums. Growth in chlorine dioxide consumption is seen for mills built later in the century because of the chemical's environmental benefits and selectivity in bleaching out lignin. One U.S. expansion has been completed by Kemanord, which upgraded its facility in Columbus, Miss., by 33,000 tpy.

Competition from oxygen and peroxide will continue. Cheap oxygen replaces chlorine dioxide in oxidative extraction installations by a 1:2 ratio. Peroxide is cutting into bleaching sequences by oxidizing effluent in caustic extraction and whitening pulp in the later stages. Finally, as dynamic mixers and these "cheap" chemicals are explored further, new systems will use fewer stages in future bleaching sequences.

A combination of these developments is being put into practice at Weyerhaeuser Co.'s technology facility in Longview, Wash. Weyco is experimenting with a 25-tpd reactor using ozone, a chemical that has been researched and approved for bleaching. Ozone generation has become a more economical process lately as municipal wastewater treatment plants and other industries expand the commercial application of this oxidizer.

PAPERMAKING. Paper furnishes have long been the proving ground for chemical suppliers. A chemical that can extend fiber, ease operational problems, and contribute to the life of equipment has unlimited staying power—until a better, cheaper one comes along. Consumption of these wet end additives is expected to grow faster than the industry itself. One industry observer values the U.S. market at $400 million for 1985. Commodities like alum and rosin account for another $100 million. (Inorganic fillers are discussed with coatings.)

Alum consumption has been threatened by the growth of alkaline papermaking, but slow conversions to this technique have lessened the severity of the situation for now. Flat prices and discounting have hampered producers in 1985. Alum's papermaking ally, rosin, is in a similar position. Consumption is tied directly to paper and paperboard production, which has leveled off this

TABLE 1: **U.S. market for paper coating binders (tons).**

	1980	1981	1982	1983	1984
Proteineous binders	15,500	15,200	15,252	15,600	17,500
Polyvinyl alcohol	5,550	5,400	5,400	5,616	6,177
Carboxymethyl cellulose	490	464	460	470	500
Acrylic thickeners	460	490	490	493	500
Sodium alginate	50	50	50	50	50

TABLE 2: **U.S. market for paper coating latexes (tons).**

	1980	1981	1982	1983	1984
Carboxylated styrene butadiene	111,150	111,000	110,000	123,000	127,500
Polyvinyl acetate	67,195	64,000	65,975	72,500	74,000
Acrylic	16,250	16,000	16,835	18,500	18,500

year. Purchasers of rosin have been switching from dispersed to paste grades because of price and availability.

Specialty chemicals fall into several categories. All have had sustained growth over the years. Among the most successful are defoamers (valued at $20 million in U.S. papermaking), dry-strength additives (valued at $65 million), retention and drainage aids (15 to 20 million lb were consumed in 1984) and wire life extenders, coagulants, flocculants, and surfactants (appraised at about $52 million).

Biocides, a $30-million market in paper production, are experiencing tremendous growth in every U.S. industry. Industry consultant Charles H. Kline & Co. Inc. predicts the U.S.'s biocide market to be $700 million in 1988. Synthetic sizing agents, currently worth $24 million, are closely associated with alkaline papermaking conversion. Their cost is somewhat higher than common alum/rosin systems. All these chemicals mentioned are consumed at a low rate (below 0.5 lb/ton of pulp produced), and several combinations of chemicals are possible. There are well over 100 suppliers, and many more are lining up. Site-specific applications are typical. Producers see growth at 3% to 6%, with strength enhancers and influent treaters leading the way.

Another promising area of quality control for papermakers is in felt washing and conditioning. Diamond Shamrock has developed a continuous felt washing system centered around a surfactant/dispersant/coupling agent which keeps felt contaminants dispersed and away from sheet forming and pressing. Customized

FIGURE 6: **U.S. consumption of wet end additives.**

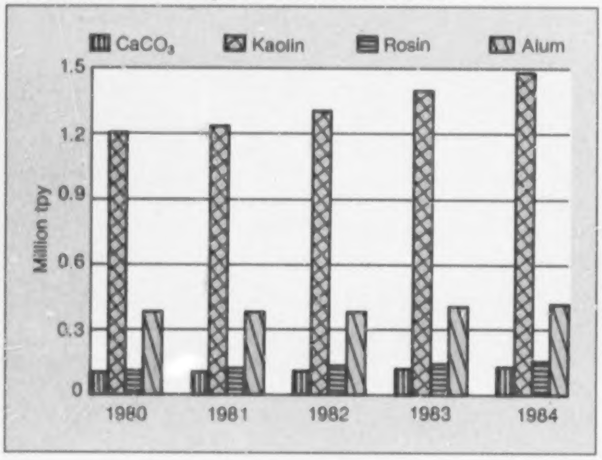


FIGURE 7: **U.S. consumption of coating materials.**

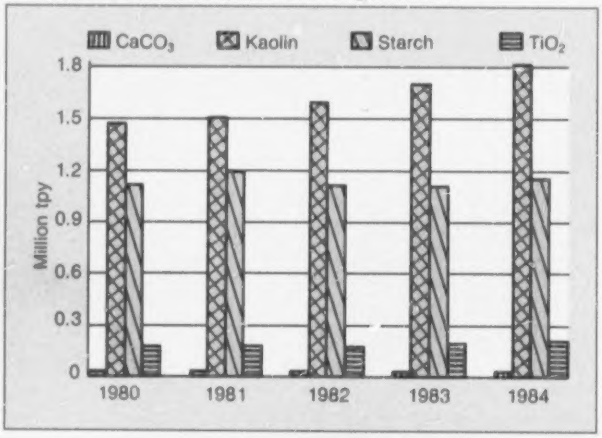


FIGURE 8: **Price history of wet end additives used in U.S. paper mills.**

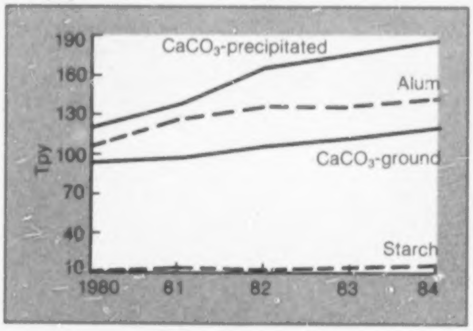
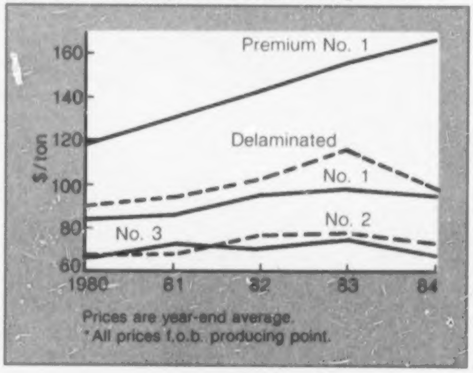
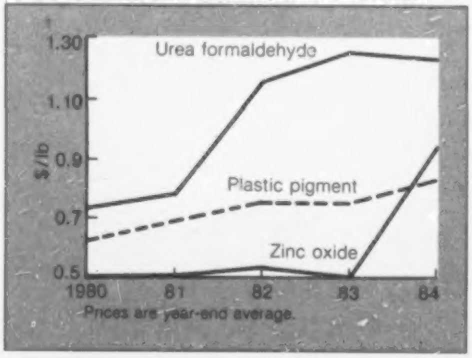


FIGURE 9: **U.S. pigment survey, coating kaolin.**



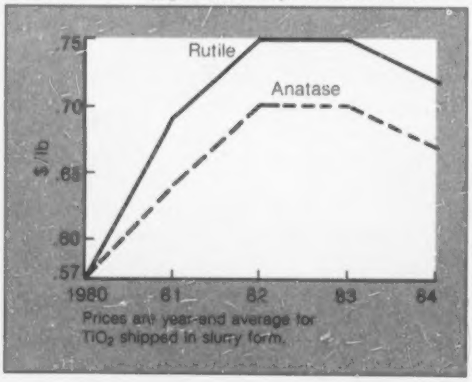
Prices are year-end average.
* All prices f.o.b. producing point.

FIGURE 10: **U.S. pigment survey, urea formaldehyde, plastic pigment, zinc oxide.**



Prices are year-end average.

FIGURE 11: **U.S. pigment survey, titanium dioxide.**



Prices are year-end average for TiO_2 shipped in slurry form.

chemical blends, typically mixed in at a rate of between 0.5 and 1.5 lb/ton (recycled grades are at the higher end), avoid "shocking" the system by adjusting to mill water pH and machine performance specifications. They extend felt life and improve moisture profiles.

The advantage of time-continuous systems over batch systems is due mainly to the elimination of downtime, helping to maintain productivity and uniformity in production. The product can be received in drum or bulk, ready to be added in a low-pressure shower aligned on the sheet side of the felt. Newsprint manufacturers have been using continuous systems for years, but as fine paper producers and others seek higher productivity through increased capacity and utilization, annual growth is seen at 10% throughout the late 1980s.

INORGANIC FILLERS, COATING. The markets for coated and filled sheets have experienced the steepest upward trend in the paper industry during the past four years. Domestic production appears to have topped out as shipments in the first half of 1985 have fallen 2% from last year. Imports of coated paper rose 85%, while exports declined 13%, according to American Paper Institute figures. Expansion announcements continue for coated paper, and chemical suppliers can expect to operate near capacity to meet these demands.

A look to the future still shows alkaline papermaking as the largest single growth area. Conversions, now adopted by nearly 10% of producers, involve switching acid-based, wet end forming to an alkaline medium. The chemicals associated with conversions are calcium carbonate, synthetic sizes, felt conditioners, retention and drainage aids (all likely to increase in consumption), and kaolin, alum, rosin, talc, titanium dioxide, and other pigments (likely to decline in consumption).

Paper formed in an alkaline medium lasts longer and offers a cost advantage to the papermaker through fiber extension (a better fiber-to-filler ratio) and chemical savings. Many suppliers of carbonate are offering new products (like "ultrafine" grades) to stay on top of the market should a quick turnaround occur. That may not be coming soon, due to resistance from paper end users.

Titanium dioxide is another filler that has experienced strong growth in this decade. Its unique ability to opacify and whiten paper is not threatened by other products, and forecasts indicate steady increases in its use. The market for slurry-based titanium dioxide has increased tremendously because of application ease and lower price. DuPont, the major supplier, is exploring the possibility of expanding its world capacity (already number one) by another 180,000 tpy with plants in Taiwan, Brazil, and South Korea.

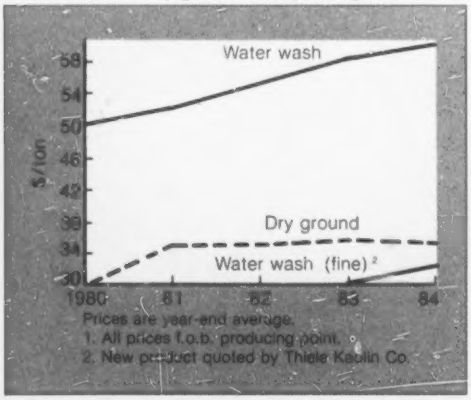
Kaolin, as a filler and coating material, has come full circle in the 1980s. After tight supply and high prices evident early on, kaolin producers now can offer paper companies all grades at modest discounts. Suppliers are relieved at the slow growth of alkaline papermaking and are optimistic about future consumption as more newsprint producers increase loads and supercalendered sheets become a larger market. Prices could rise up to 5% next year for all grades. The export market in the South Pacific will be cut by the construction of a kaolin processing facility announced by Comalco of Australia.

Starch manufacturers have been stable suppliers to papermakers, despite feeble prices and overcapacity. About 80% of the starch shipped to paper companies is applied at the size press; the rest is in binding coating. New uses are being pushed for unmodified and modified grades at the wet end as more of the market is lost to latex cobinders. Latex affords a higher solids content and better printing surfaces than does starch.

Proteinous binders have also lost market share, as casein and soya give way to binders that exhibit lower viscosity at higher solids. Soy-based polymers have exhibited strong growth as cobinders in clay coating systems. Ralston Purina, the recognized leader in soy polymers, sees a bright future due to expanded applications with high-tech coating systems that have documented results in improved binding ability, water holding, rheology modification, and viscosity control. Polyvinyl alcohol, once thought to be the savior of binding materials, has never achieved predicted consumption rates due to poor rheological properties and difficulty in mill water chemistry. Binders such as carboxymethyl celluiose, acrylic dispersants, and sodium alginate are used mainly as water retention aids and are usually included in the formulas of synthetic latexes. Carboxylated styrene-butadiene latex is the most widely consumed latex. This chemical offers great flexibility, which should ensure its steady growth while papermakers try to accommodate the ever-changing face of the printing industry.

Although the binder-to-fiber ratio is dropping in typical systems, new paper products should offset any decline in use. Polyvinyl acetate enjoys a good piece of the coated paperboard market since it can provide high glueability and absorbancy. All synthetic latexes should encounter modest growth if the coated paper and paperboard markets keep up their current pace. Automated coating kitchens, installed in just a few places now, will up the consumption of ready coating materials. ■

FIGURE 12: **U.S. pigment survey, filling kaolin.**



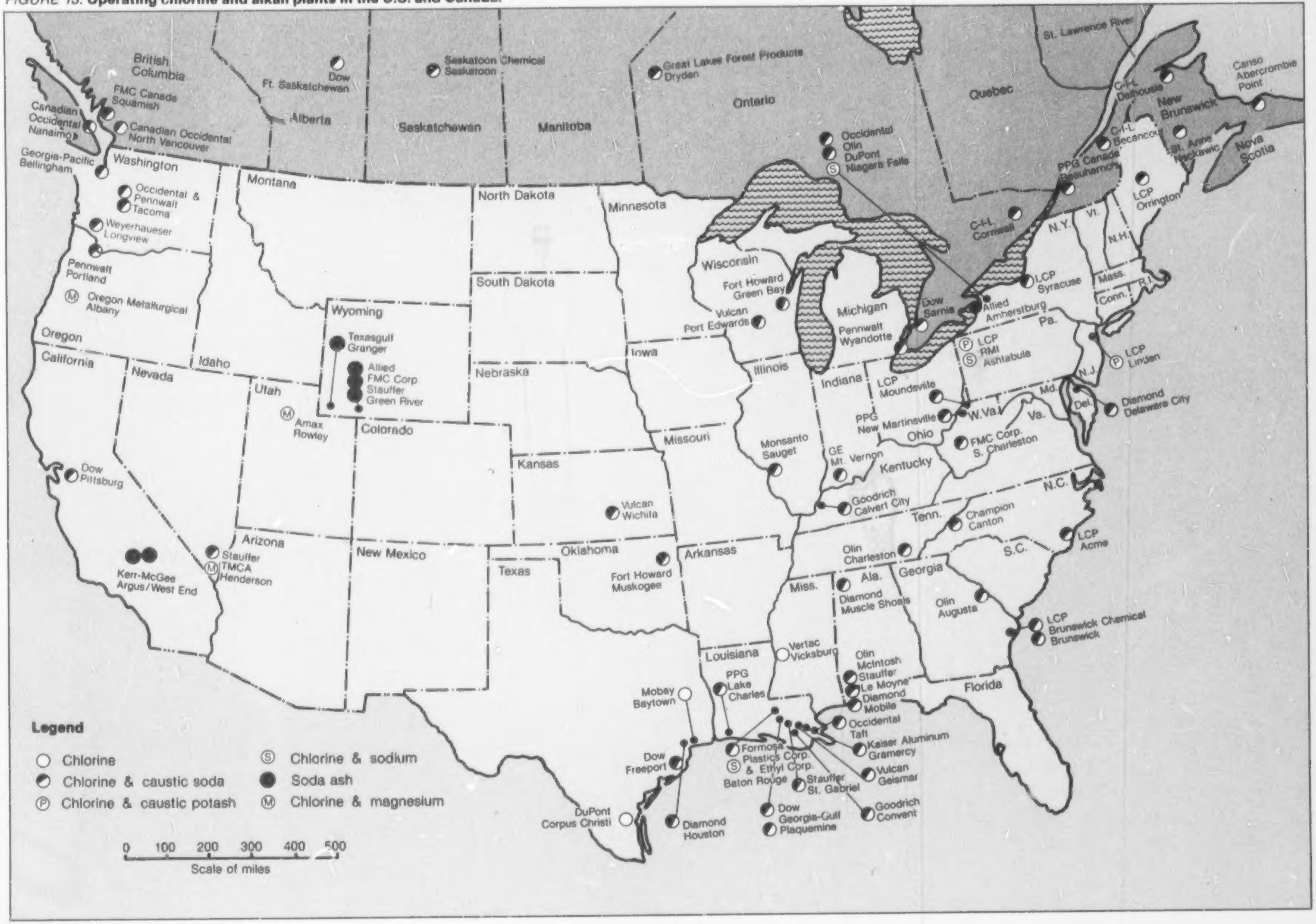
Prices are year-end average.
1. All prices f.o.b. producing point.
2. New product quoted by Thiele Kaolin Co.

TABLE 3: **1984 consumption of chemicals for the recycled papermaking industry (short tons), and current list prices.**

Chemical	Recycling process	All pulp & paper	All industries	1985 price ($/short ton)
Caustic	12,220	2,000,000	11,600,000	$150[1]
Sodium silicate	11,421	12,500	750,000	296[2]
Sodium carbonate	11,750	200,000	8,465,000	120[3]
Hydrogen peroxide	5,000	17,000	137,000	465[4]

1. Liquid, 50%, seller's tanks, Gulf Coast works, f.o.b., freight equalized, 76% Na_2O.
2. Solid or glass, 3.22–3.25 ratio, bulk, 100-lb bags.
3. Dense, 58%, 100-lb bags, f.o.b. works.
4. 35% solution, tanks, freight equalized.

FIGURE 13: **Operating chlorine and alkali plants in the U.S. and Canada.**


British Columbia
FMC Canada Squamish
Canadian Occidental Nanaimo
Canadian Occidental North Vancouver
Georgia-Pacific Bellingham
Washington
Occidental & Pennwalt Tacoma
Weyerhaeuser Longview
Pennwalt Portland
Ⓜ Oregon Metallurgical Albany
Oregon
California
Dow Pittsburg
Nevada
Kerr-McGee Argus/West End
Idaho
Montana
Alberta
Dow Ft. Saskatchewan
Saskatchewan
Saskatoon Chemical Saskatoon
Manitoba
Great Lakes Forest Products Dryden
Ontario
Quebec
St. Lawrence River
Wyoming
Texasgulf Granger
Allied FMC Corp Stauffer Green River
Utah
Ⓜ Amax Rowley
Colorado
Arizona
Stauffer Ⓜ TMCA Henderson
New Mexico
North Dakota
South Dakota
Nebraska
Kansas
Vulcan Wichita
Oklahoma
Fort Howard Muskogee
Texas
DuPont Corpus Christi
Dow Freeport
Diamond Houston
Mobay Baytown
Minnesota
Iowa
Missouri
Arkansas
Louisiana
PPG Lake Charles
Formosa Plastics Corp. Ⓢ & Ethyl Corp. Baton Rouge
Dow Georgia-Gulf Plaquemine
Stauffer St. Gabriel
Goodrich Convent
Vulcan Geismar
Kaiser Aluminum Gramercy
Occidental Taft
Vertac Vicksburg
Miss.
Olin McIntosh Stauffer Le Moyne Diamond Mobile
Ala.
Diamond Muscle Shoals
Wisconsin
Fort Howard Green Bay
Vulcan Port Edwards
Illinois
Monsanto Sauget
Michigan
Pennwalt Wyandotte
Dow Sarnia
Indiana
GE Mt. Vernon
Goodrich Calvert City
Kentucky
Tenn.
Olin Charleston
Champion Canton
Georgia
Olin Augusta
S.C.
N.C.
LCP Acme
LCP Brunswick Chemical Brunswick
Florida
Ohio
LCP Moundsville
PPG New Martinsville
W.Va.
FMC Corp. S. Charleston
Va.
Md.
Del.
Diamond Delaware City
N.J.
Ⓟ LCP Linden
Pa.
Ⓟ LCP RMI Ⓢ Ashtabula
Allied Amherstburg
Occidental Olin DuPont Ⓢ Niagara Falls
C-I-L Cornwall
N.Y.
LCP Syracuse
PPG Canada Beauharnois
Vt.
N.H.
Mass.
Conn.
R.I.
LCP Orrington
C-I-L Becancour
C-I-L Dalhousie
New Brunswick
St. Anne Nackawic
Nova Scotia
Canso Abercrombie Point
Legend
○ Chlorine
◐ Chlorine & caustic soda
Ⓟ Chlorine & caustic potash
Ⓢ Chlorine & sodium
● Soda ash
Ⓜ Chlorine & magnesium
0 100 200 300 400 500
Scale of miles

CHEMICALS

Canadian pulp and paper industry increases chemical uses in 1984-85

Pulp & Paper's survey shows consumption increases in clay and peroxide; environmental additives are expected to grow rapidly in future

By MICHAEL J. DUCEY, Technical Editor

■ The Canadian pulp and paper industry is stable and expanding. Production is currently falling off somewhat from 1984 levels but by year-end will probably equal that of last year. Expansions are being announced and two new machines should be operating in the next two or three years. Output across all grades is dropping mainly because of curtailed exports and high inventories. Should the U.S. dollar weaken, all North American manufacturers would reduce inventories and resume high utilization rates.

New capacity announcements have been numerous. Two new mills are proposed for British Columbia. Makin Pulp & Paper Ltd. is planning to construct a 70,000-metric-tpy coated free-sheet mill in Britannia Beach, and Fibreco (a 35-member consortium of Canadian wood products manufacturers) is still looking for a greenfield market pulp mill site. Incremental expansions are planned for many mills from Nova Scotia to British Columbia.

This is all good news for suppliers of chemicals to Canada, but it is perhaps offset by the continued technological advances that are improving the efficiency of chemical additions. Among these are "closed-mill" concepts, mechanical equipment, and increased automatic process control. Strikes, downtime, and bad weather are also having an effect on chemical shipments to pulp and paper mills. One industry watcher predicts the Canadian industry's chemical consumption will be 3.5 million metric tpy.

The chemical industry itself is steady. Exports are helping to stem the tide against discounting and depressed prices in some markets. Major producers have announced $489 million in capital expenditures for 1985, 35% more than in 1984. New plants are also scheduled for construction during the latter half of this decade. Supply is expected to keep pace with demand, and imports are currently slowing. Chemical companies are showing small profits but not of the magnitude seen in past economic recoveries.

PULPING. Newsprint and other groundwood papers account for more than 40% of the Canadian market. These pulps are processed by mechanical means, requiring little if any chemical additions. Many producers are experimenting with chemical pretreatment using saltcake and other sodium-based compounds. The evolution of chemi-thermomechanical pulp (CTMP) and similar configurations combining chemical and mechanical pulping methods are coming of age as a few pulp lines have been converted to use these techniques. These processes will use between 20 and 50 kg of chemical per metric ton of pulp produced.

Chemical pulps have been forecast to grow at rates of 2% to 3% during the late 1980s. More chemical pulp is produced in Canada than any other kind of pulp, and chemical pulp will consume over 70% of the volume of chemicals purchased by the industry. The sulfate (kraft) pulping process is employed by 45 mills, producing 10.6 million metric tpy. Modified cooking, including increased chemical charges, is fast becoming popular due to reported increases in yield and lower energy costs. Otherwise, new developments have been slow in evolving. Pulp mills have been trading saltcake for caustic and emulsified sulfur for economic reasons. In recovery operations, the dominant chemical used is lime. Lime consumption, shown in Figure 1, includes use in wastewater treatment.

Sulfite pulping is employed at 28 Canadian mills and has been declining since the early 1970s, mostly because of mounting environmental regulations. The best forecasts indicate a steady drop in the 2.5 million metric tpy of sulfite pulp produced. Chemical charges consist of sulfur dioxide, sulfur, and sodium hydroxide in one of four base chemicals: calcium, sodium, ammonia, and magnesium. All suppliers of these chemicals say they will be able to meet demand.

Canada is the world's largest reserve holder of sulfur (even though sources say the Alberta sour gas depository wastes are currently being regenerated) and may be in the driver's seat should demand take off soon. Western Canada possesses a large reserve of saltcake and would be in an advantageous position if the price of caustic increases dramatically.

FIGURE 1: **Consumption of pulping chemicals in Canada.**

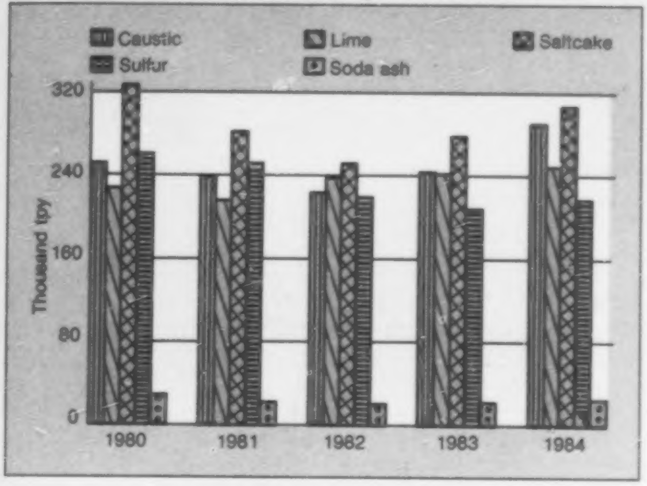
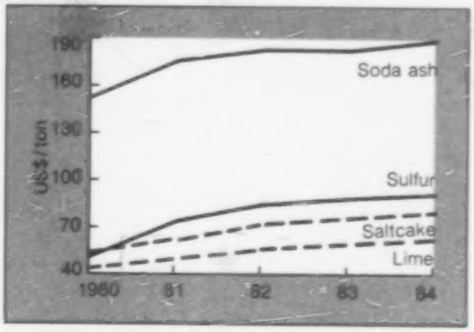


FIGURE 2: **Price history of Canadian pulping chemicals.**



There are several variations of sulfite pulping, but most industry sources agree that the wave of the future belongs to alkaline sulfite pulping. One mill will start up a system using this process in the near future.

Organosolv and other innovative pulping processes are currently being studied at many pulp and paper research institutes, but commercial applications have yet to become a reality.

BLEACHING. Mechanical pulp bleaching is a central issue in Canada, as thermomechanical pulping and other mechanical means of pulping gain a wider share of pulp production. Sodium hydrosulfite, purchased or produced onsite via the borol process, is the main chemical used to bleach mechanical pulp. No new technological developments have been reported for this one-stage, single-vessel process.

Many mills use single-stage continuous peroxide bleaching at medium and high consistency or employ two-stage peroxide-hydrosulfite for pulps of low post-brownstock brightness. These pulps are brightened to between 65 and 80 GE, whitening but not removing the lignin present. Peroxide manufacturers are counting on large growth, having announced two new mills with a total annual capacity of 46 million kg.

Demand for peroxide at the end of the decade is expected to double from present consumption but still will not fully use the new capacity. In another development, Dow Chemical has been experimenting with an onsite generator for producing a caustic solution of peroxide in a joint venture with Huron. The onsite caustic/peroxide generators will cost about \$3.2 million each and could produce 10 metric tpd of peroxide.

FIGURE 3: **Consumption of bleaching agents in Canadian mechanical pulp mills.**

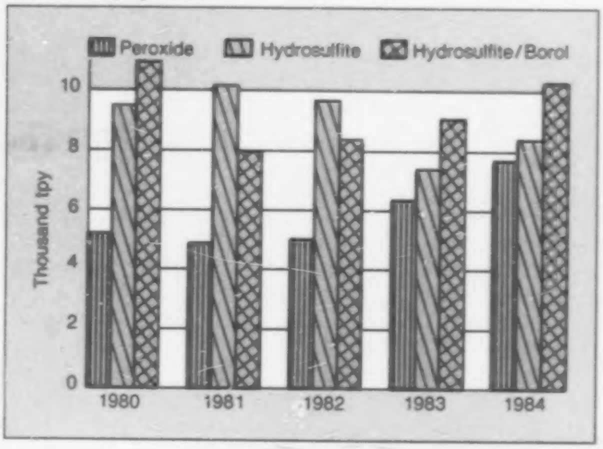
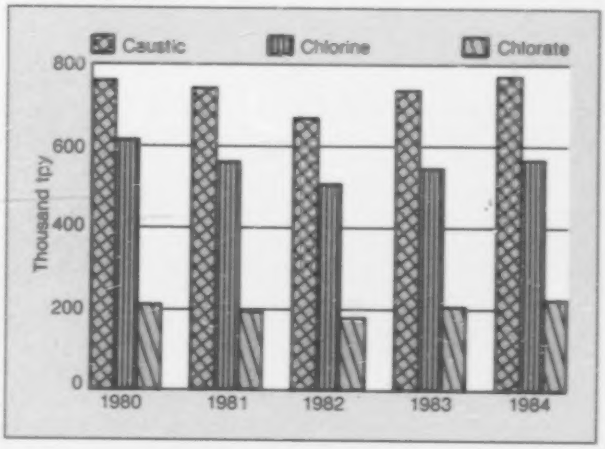
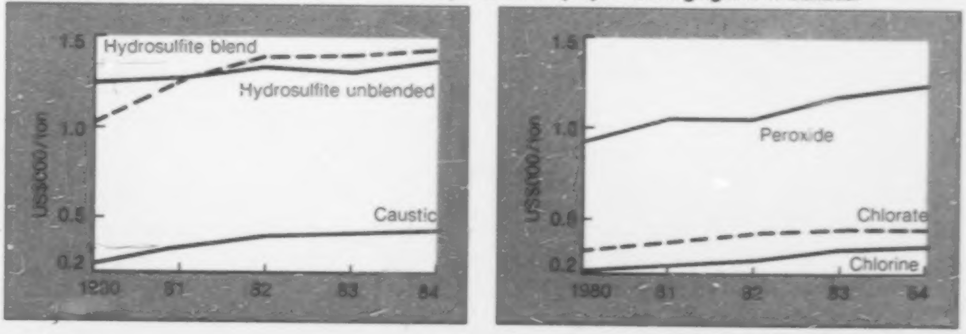


FIGURE 4: **Consumption of bleaching agents in Canadian chemical pulp mills.**



FIGURES 5A and B: **Price history of the most widely consumed pulp bleaching agents in Canada.**



Chemical pulp bleaching has always been the largest consumer of chemicals in pulp processing. High-brightness market pulp is a key export for Canada, and manufacturers have been quick to adopt applications to enhance profitability.

Chlorine is the chief chemical used to bleach chemical pulp and will remain so throughout the decade. Supplies of chloralkali chemicals appear to be adequate for now as moderate growth in their use is predicted.

Canadian bleacheries have installed oxygen systems at a pace that rivals the Scandinavians. Oxygen use will increase in commercial processes as a first-stage delignifier and in caustic extraction to ease later-stage consumption of more expensive chemicals. Other innovative uses of oxygen are also being explored in lime kiln enrichment and the larger growth area of black liquor oxidation. The consumption of metal ion chemicals, also used with oxygen as pulp protectants, will grow along with oxygen use.

The capacity for sodium chlorate, the chief reactant in the production of chlorine dioxide, is growing in Canada. Two expansions are scheduled for this year, and two more are planned for 1986. The metal electrode process is quickly replacing the old graphite method in these expansions. Exports to the U.S. market have grown steadily throughout the 1980s, and 135,000 metric tons are expected to cross the border this year (mostly bound for eastern points).

Canada enjoys a production cost advantage over the U.S. Power costs in Quebec are sometimes half of those in the southern U.S. The Canadian plants are also newer than those in the U.S. and are therefore easier to expand. Another fact worth noting is the economics in shipping. The most economical method of shipping chlorate from Canada is in crystal form, acceptance of which is growing in the U.S. Many mills can only receive chlorate solution, but as more mills desire a cheaper product cost, the installation of dissolving systems may become prevalent.

Chlorine dioxide generating systems are coming under closer scrutiny. Spent acid from older systems that is disposed of via the mills' chemical recovery systems will need to be reduced as Canadian environmental regulations dictate lower emission rates. This may bolster ways of reducing chlorine dioxide use (through oxygen and hypochlorite substitution), or it may lead to the installation of newer, more efficient generators. The consumption of methanol and other reactants used in chlorine dioxide production would thus be decreased.

PAPERMAKING. A wide range of chemicals are used in paper furnishes, and it would be impossible to cover each in detail. The papermaking process in Canada was worth over $100 million to chemical suppliers last year, the bulk consisting of alum, rosin, and specialty chemicals (excluding inorganic fillers, which will be covered with coatings.)

Rosin is mixed with the furnish to inhibit water penetration in the finished sheet. Its addition causes a pH shift which can be adjusted by mixing alum into the system, adding exact stochiometric measurements as the furnish requires, but it can be assumed that a 1:1.5 ratio of alum to rosin is the norm. Therefore, consumption growth in alum and rosin can be predicted per grade of paper consumed.

Briefly, fine papers are expected to grow at an average of 7% per year. Specialty groundwood papers are forecast to grow to 935,000 metric tpy for 1985 (common alum addition is 30 g/metric ton). Newsprint growth is leveling and will only grow at a 1% rate, as will containerboard. Finally, tissue capacity is expected to maintain a 2% annual increase through 1989.

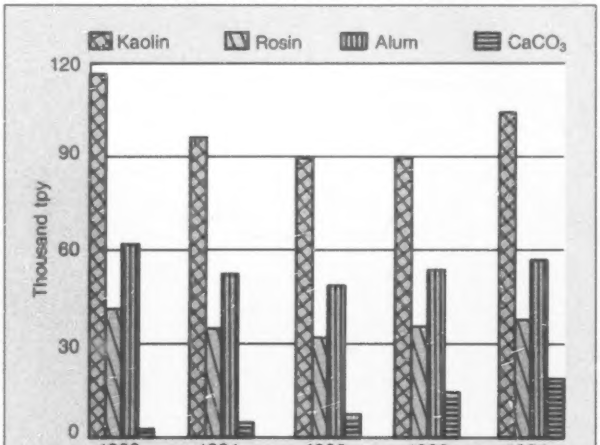
Wet end additives as a whole are usually site specific with demand and are designed to meet grade, machine, and production specifications. Charles H. Kline Co. Inc., a leading chemical consultant, has published data on these chemicals and their use. It concludes that the Canadian industry uses about $53-million worth of these chemicals annually: defoamers, $8 million; wet-strength additives, $10 million; dry-strength additives, $10 million; retention and drainage aids, $6 million; biocides $3 million; dispersants, $3 million; felt conditioners, $2 million; synthetic sizing agents, $2 million; waxes, $1 million; and another $8 million in coagulants, flocculants, flow modifiers, surfactants, and chelating agents.

INORGANIC FILLERS, COATINGS. For the past two decades, consumption of coated paper and paperboard has exceeded consumption rates for the total Canadian paper industry (on a percentage basis). This year, Canadian manufacturers should produce close to 350,000 metric tons of coated paper and another 275,000 metric tons of coated paperboard. These figures are based on *Pulp & Paper* estimates since the Canadian Pulp & Paper Assn. and Statistics Canada do not distinguish coated production from uncoated. These numbers indicate high utilization rates—in some cases over 100%. One major capacity addition in coated paper has been announced by Repap Enterprises Inc. It plans to start up a new lightweight coated machine at its Newcastle, N.B., site some time next year.

Tables 1 and 2 detail the Canadian market for paper binders and latexes, while Figure 7 describes the Canadian market for major fillers and coating materials. The growth of these products is tied to the health of the coated paper industry, which appears to be stable. An informative source has detailed the Canadian market for binders and latexes, and a few interesting points should be noted.

First, the market share and volume of natural binders

FIGURE 6: **Consumption of wet end additives in Canada.**



has decreased. Second, the volume of binders consumed has not increased as rapidly as the volume of coated paper and paperboard produced. This is attributed to the improved efficiency of modern synthetic binders and is further supported by the steadily growing use of acrylic thickeners and carboxymethyl cellulose. Another point worth raising is the decline (and near elimination) of casein use in Canada, mainly because of its price and availability problems and the increased substitution of soya and synthetics.

FIGURE 7: **Consumption of the most widely used paper coatings in Canada.**

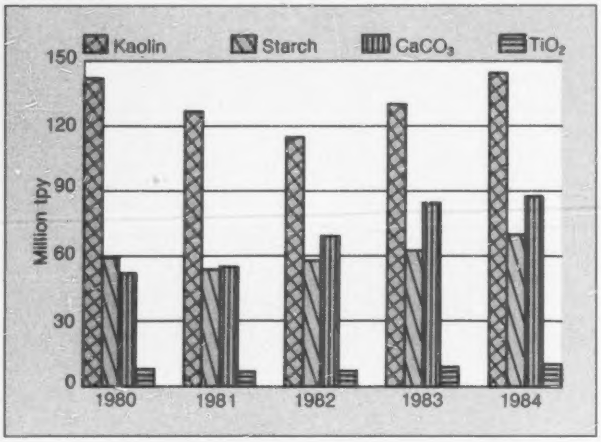
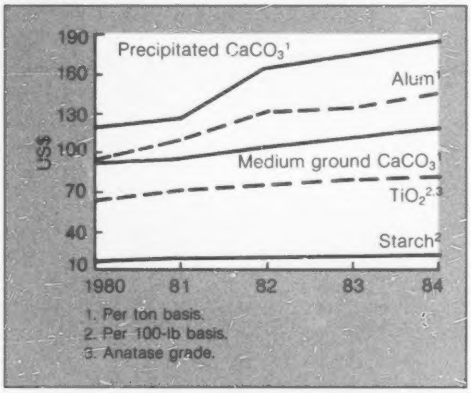


FIGURE 8: **Price history of coating materials used in Canada.**



1. Per ton basis.
2. Per 100-lb basis.
3. Anatase grade.

TABLE 1: **Canadian market for paper coating binders (tons).**

	1980	**1981**	**1982**	**1983**	**1984**
Starch	4,200	4,000	3,650	3,400	3,400
Proteineous binders	700	600	450	500	500
Polyvinyl alcohol	10	10	10	10	10
Carboxymethyl cellulose	60	80	110	150	155
Acrylic thickeners	25	30	70	110	115
Sodium alginate	20	15	10	10	10
Synthetic latexes	7,150	7,250	7,900	8,700	9,300
Total	**12,165**	**12,265**	**12,200**	**12,800**	**13,490**

Source: Polysar Latex.

TABLE 2: **Canadian market for paper coating latexes (tons).**

	1980	**1981**	**1982**	**1983**	**1984**
Carboxylated styrene butadiene	5,950	6,100	6,300	7,000	7,600
Polyvinyl acetate	1,000	1,150	1,400	1,550	1,700
Acrylic	200	200	200	150	100

Source: Polysar Latex.

Surface-sizing starch, mostly derived from corn, is the most popular coating material. Low price, high availability, easy application, and numerous grades account for starch's wide acceptance. Growth will remain steady throughout the 1980s, increasing with the production of boxboard, corrugating adhesives, and all surface-sized paper. The supply from U.S. sources is abundant, as is the supply from such Canadian companies as Nascan, St. Lawrence, and the newcomer, Casco (a joint venture of John LaBatt and Canadian Starch).

Growth of inorganic material use is also tied to production. Kaolin is used by paper and paperboard mills as a coating pigment (58%) and as a filler (42%)—its primary market. Canada imports its clay from the U.S. and also buys a very small amount from the U.K. There has been a minor surge in consumption for 1984 and 1985, which can be completely attributed to the economic recovery. The Canadian market for kaolin clay is valued at over $20 million. This figure could rise should newsprint manufacturers continue to add kaolin in the large amounts seen this past year.

Titanium dioxide is used to a lesser extent on a per ton basis, but its value is estimated at over $14 million. Price and supply are reliant on the paint industry, major factors being housing starts and automobile production. Canada's two producers, Tioxide and NL Chemicals, have lapsed in deliveries to paper mills. The supply gaps have been filled by U.S. companies (the only increase in chemical imports this year). In fact, NL Chemicals has met the challenge by announcing a capacity expansion that will double output at its Varennes, Que., plant by mid-1987. World supply has tightened considerably over the 1970s and 1980s, and price increases reflect these trends. Titanium dioxide consumption is increasing in paper mills at a 7% to 10% rate for 1985.

The paper industry is also the primary market for precipitated carbonates. This trend may skyrocket if Canadian producers switch to alkaline papermaking. Ground calcium carbonate shares the market equally with precipitated grades, separated only by the type and quality of the desired finished sheet.

SUMMARY. A healthy Canadian pulp and paper industry will invite chemical companies to experiment with new, innovative chemical additions as well as expand on uses for the old ones. Corpus Chemicals, an Ontario-based information firm, estimates that 3.5 million metric tons of chemicals were purchased by the industry in 1984, a 7% increase from the previous year. A mild 2% increase per year is predicted through 1988, bringing total consumption to close to 4 million metric tons. This bullish review is based on two emerging trends.

First, it is visualized that the wood base (wholetree chips, slab wood and other residuals, new species, etc.) will decline for the next decade and a half, causing greater variation in pulp quality. Thus, more pretreatment and posttreatment of pulp to improve cleanliness, yield, and brightness will be initiated by chemical use. Second, it is thought that better use of chemicals to produce paper more efficiently will open opportunities for companies experimenting with fiber extension, new product grades, and environmental systems. ■